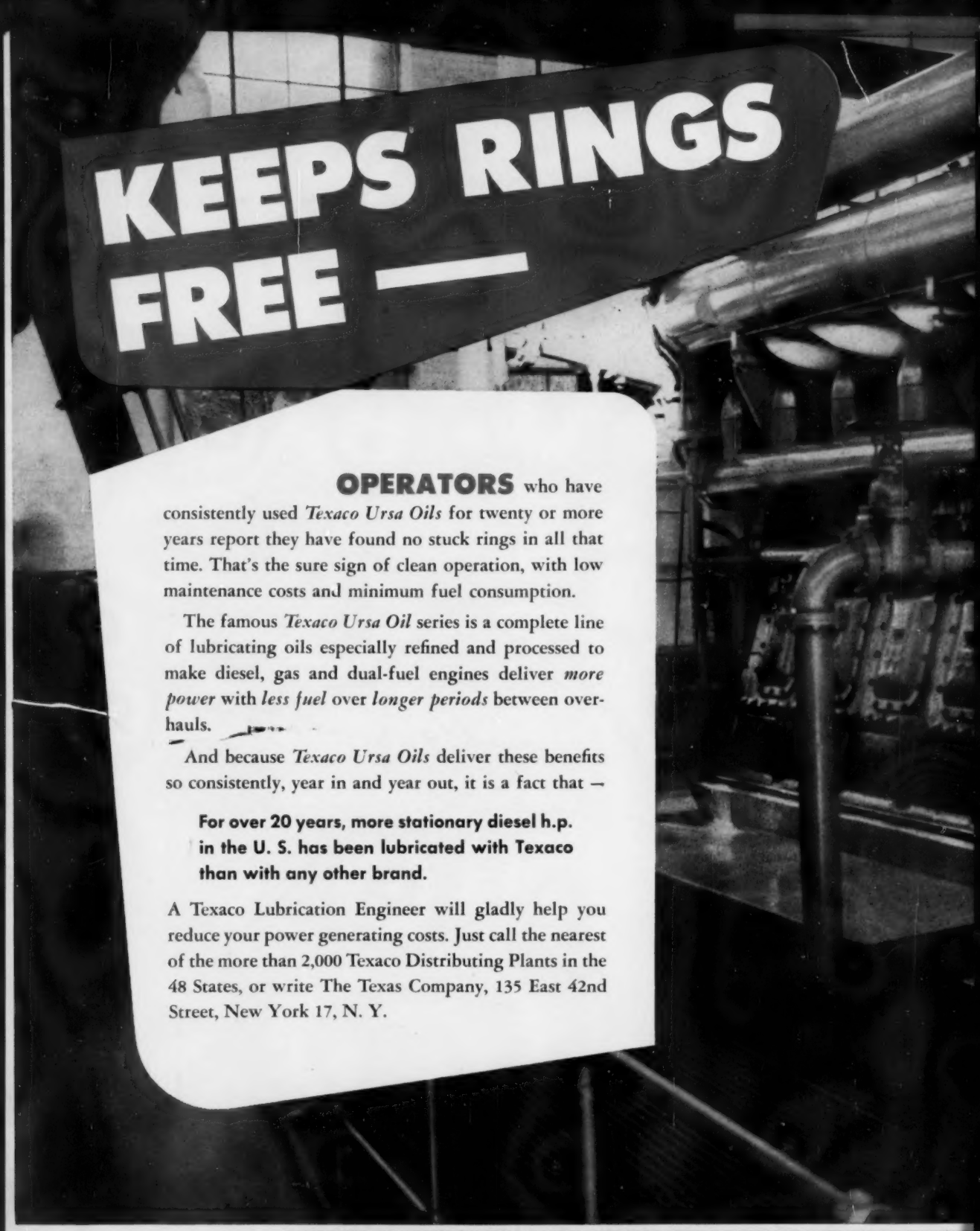
diesel power

July 1955

Valves
Oil
Generators
Gears
Filters
Engines
Bearings



OPERATORS who have consistently used *Texaco Ursa Oils* for twenty or more years report they have found no stuck rings in all that time. That's the sure sign of clean operation, with low maintenance costs and minimum fuel consumption.

The famous *Texaco Ursa Oil* series is a complete line of lubricating oils especially refined and processed to make diesel, gas and dual-fuel engines deliver *more power* with *less fuel* over *longer periods* between overhauls.

And because *Texaco Ursa Oils* deliver these benefits so consistently, year in and year out, it is a fact that —

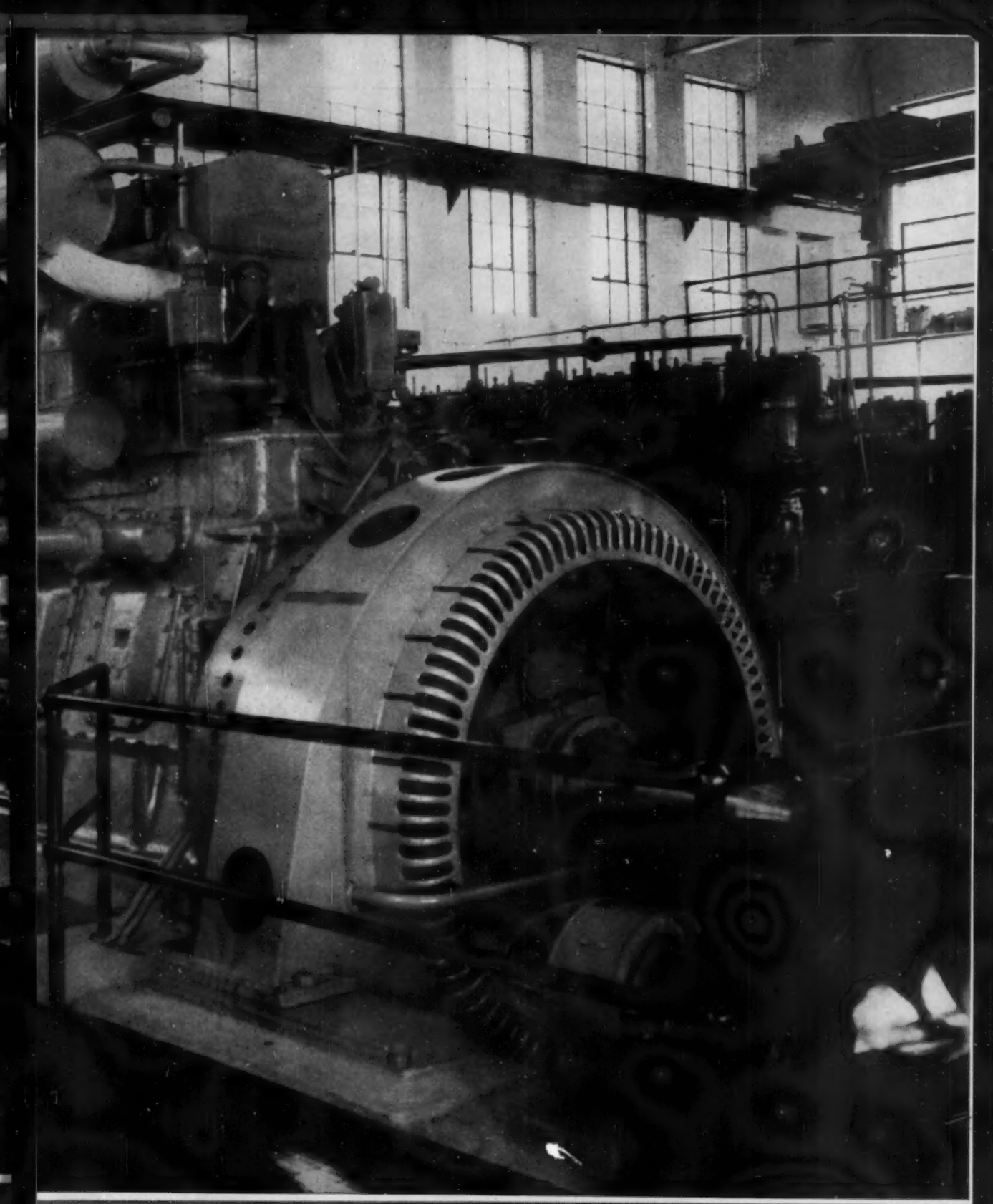
For over 20 years, more stationary diesel h.p. in the U. S. has been lubricated with Texaco than with any other brand.

A Texaco Lubrication Engineer will gladly help you reduce your power generating costs. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.

TUNE IN . . .
TEXACO STAR THEATER
starring
DONALD O'CONNOR
or JIMMY DURANTE
on television . . .
Saturday nights, NBC.

TEXACO

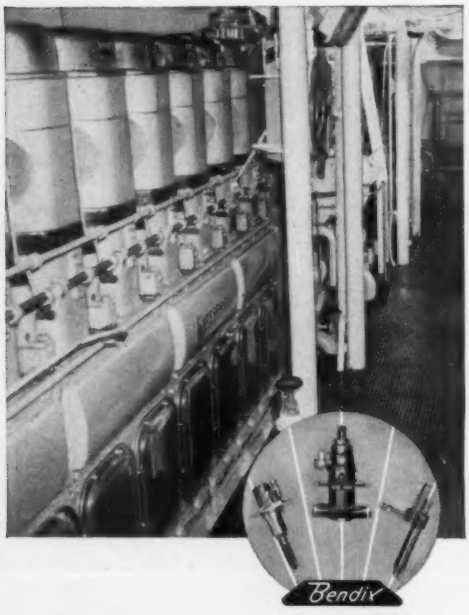
TEXACO
REG. T.M.



URSA OILS

FOR ALL DIESEL, GAS AND DUAL-FUEL ENGINES

New York City fireboat pumps 14,000 gallons per minute without warmup . . . thanks to ENTERPRISE DIESELS and Bendix FUEL INJECTION EQUIPMENT!



As an emergency vessel the *John D. McKean*, New York City's newest fireboat, must be ready to go into action at a moment's notice. This means that her main propulsion and pumping engines, 4 Bendix-equipped Enterprise Diesels, may be called upon at any time to drive her full speed ahead while spraying up to 14,000 gallons of water per minute!

Obviously this is a job where constant dependability is the foremost requirement. In fact, it would be difficult to subject these Bendix-equipped Enterprise Diesels to a more rigorous task. Yet, the *John D. McKean* in a highly successful series of dock and sea trials met every rugged requirement for which she was designed.

Here, once again, is further proof that for reliable performance, Bendix* Fuel Injection Equipment is the logical choice for any diesel engine manufacturer.

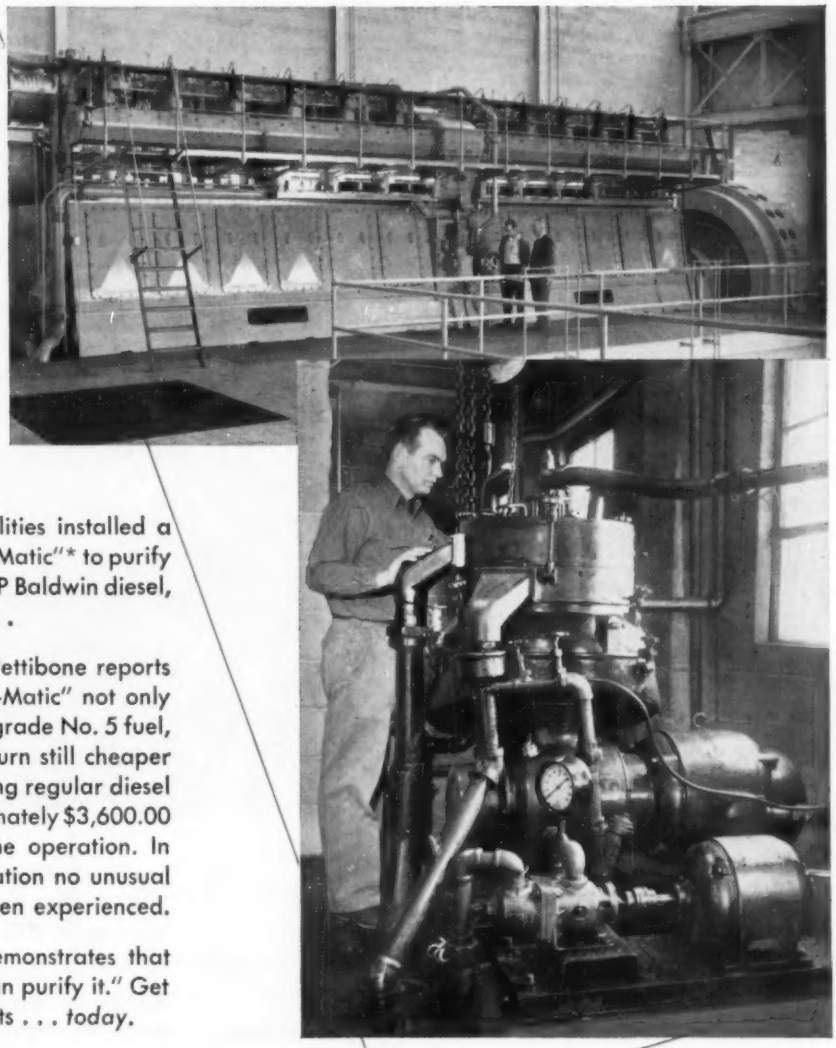
*REG. U.S. PAT. OFF.

SCINTILLA DIVISION OF BENDIX AVIATION CORPORATION
SIDNEY, NEW YORK
Export Sales: Bendix International Division • 205 East 42nd Street, New York 17, N.Y.

SCINTILLA DIVISION

Bendix AVIATION CORPORATION

DE LAVAL "NOZZLE-MATIC" SAVES $3,600 IN ONE MONTH!



When Decatur Public Utilities installed a De Laval AC-VO "Nozzle-Matic"* to purify heavy fuel for their 5380 HP Baldwin diesel, things really happened . . .

As Superintendent L. C. Pettibone reports it: The De Laval "Nozzle-Matic" not only completely purified poor grade No. 5 fuel, but made it possible to burn still cheaper No. 6! Savings over burning regular diesel fuel amounted to approximately $3,600.00 in one month of part-time operation. In over 3800 hours of operation no unusual ring or liner wear has been experienced.

Once again De Laval demonstrates that "If you can pump it, we can purify it." Get all the money-making facts . . . *today*.

*Trademark

DE LAVAL
heavy oil purifiers

THE DE LAVAL SEPARATOR COMPANY Poughkeepsie, New York • 427 Randolph St., Chicago 6 • DE LAVAL PACIFIC CO. 61 Beale St., San Francisco 5

GM DIESEL
CASE HISTORY No. 1A3-16

OWNER: Crowe Coal Company, Kansas City, Mo.

INSTALLATION: Six GM Diesel-powered Dart trucks . . . three 20-ton rear-dumps and three 40-ton bottom-dumps. GM Diesel-powered Bucyrus-Erie #38-B shovel with 2¼-yard bucket. The company also operates three 20-ton bottom-dumps powered with 4-cycle Diesels.

PERFORMANCE: GM Diesel-powered trucks have faster pickup, respond to throttle controls better, use less lube oil. Engines take less time—cost less to overhaul. Shovel strips 1000-1200 tons of coal in 7¼ hours—burns 4 gallons of fuel per hour.

Quicker Pickup-Faster Hauling

MISSOURI's Crowe Coal Company operates nine trucks—six powered by General Motors 2-cycle Diesels and three with 4-cycle Diesels. They report the GM Diesel-powered trucks "respond quicker, use less lube oil, are easy to overhaul."

A General Motors Diesel does "respond quicker." It gets more work done than most engines, partially because of its 2-cycle "power on every piston downstroke" design. It costs less to buy. It costs less to maintain because GM Diesel replacement parts cost less (valves up to 62% less and cylinder liners up to 40% less) than parts for comparable Diesels.

Today you can get GM Diesel power in more than 750 different models of equipment built by over 150 manufacturers. Call in your local GM Diesel distributor or write direct for more information.

It Pays to Standardize on

GM
GENERAL MOTORS
DIESEL POWER

DETROIT DIESEL ENGINE DIVISION
GENERAL MOTORS • DETROIT 28, MICHIGAN
Single Engines . . . 30 to 300 H. P. Multiple Units . . . Up to 893 H. P.

editors notes...

You'll want to read about...

How EMD's facilities for locomotive production are now modifying the equipment so familiar to all railroad men for service in other fields. First it was packaged power for electrical generation: Now it is a unit tailored for the oil drilling industry . . . .

The application of fluid couplings versus hydraulic torque converters. You'll find out how each works, individual characteristics, and where each applies. One or the other could be the answer to your transmission problems . . . .

Caterpillar's exposition to show all their post-war developments and products to their world-wide family of dealers . . . .

An operating report telling how the 2400-hp general-purpose Train Masters are cutting one railroad's operating costs . . . .

The latest of Harnischfeger's engine improvements involving the adoption of the RoosaMaster fuel injection system . . . .

Cummins JT-6 "Turbodiesel", an outgrowth of their experience with their race car engine. More power in a smaller, lighter package opens new applicational possibilities. It might give you some ideas . . . .

diesel power

Established in 1923 **Vol. 33, No. 7** **July, 1955**

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Diesel Publications, Inc., 192 Lexington Avenue, New York 16, N. Y.

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DETROIT DIESEL ENGINE DIVI
GENERAL MOTORS • DETROIT 28, MICHIGAN
Single Engines . . . 30 to 300 H. P. Multiple Units . . . Up to 893

You'll want to read about...

Things to know about selecting or specifying radiators. After you read this article you'll have a better idea about what you want, how to be sure that you get it, and how to hold costs down . . . .

Cutting the time and mess in cleaning centrifuge bowls. To which the operators will say "Amen" . . . .

Cooper-Bessemer's new centrifugal pumps for the petroleum industry . . . .

A new slant in checking GM Series 71 engine camshaft timing without unbuttoning the gear case . . . .

And don't skip the features; there's meat in them for you . . . .

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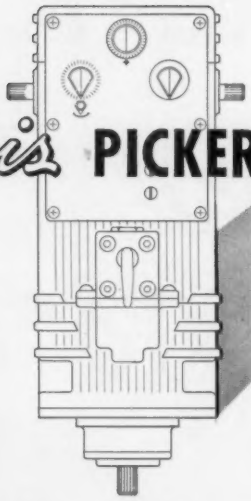
Farris PICKERING MECHANICAL & HYDRAULIC GOVERNORS

1955



In this engineering department, constant planning keeps Farris Pickering Governors abreast of the technical advances in the fields they serve.

The most advanced production machines are working at full speed to supply the demand for dependable speed control devices. But quantity is, as always, secondary to quality, on which both Farris and Pickering have built their reputations.

Farris Pickering—a name famous for quality construction and dependable performance for nearly a century—offers you the finest achievements in mechanical and hydraulic governor design, with a wide range of types and sizes to meet every speed control requirement.

During the past few years, since the Farris-Pickering affiliation, increased emphasis has been placed on research and development . . . new advanced designs, engineered to meet the most exacting present-day requirements of industry, are the result.

Today, more than ever before, precision manufacturing on the most modern production equipment assures satisfaction . . . backed by superior service, with immediate availability of replacement parts and rapid processing of orders and shipments.

Besides the standard line of Farris-Pickering governors, we are geared to meet your particular requirements for custom-designed equipment. We'd be pleased to send you complete information.

AND YOU'LL SAVE when your Pickering Governors are "factory serviced"

Your original service cost is your only cost. You get factory "know-how", factory parts, factory adjustments. You get fair-price repairs with parts supplied at net. Your governor is tested and set on a $25,000 dynamometer—not a junior-sized, "just as good" portable unit that cannot give you load control governing results. You get a Factory Rebuilt Guarantee. Send your governor "home" for service—and save!

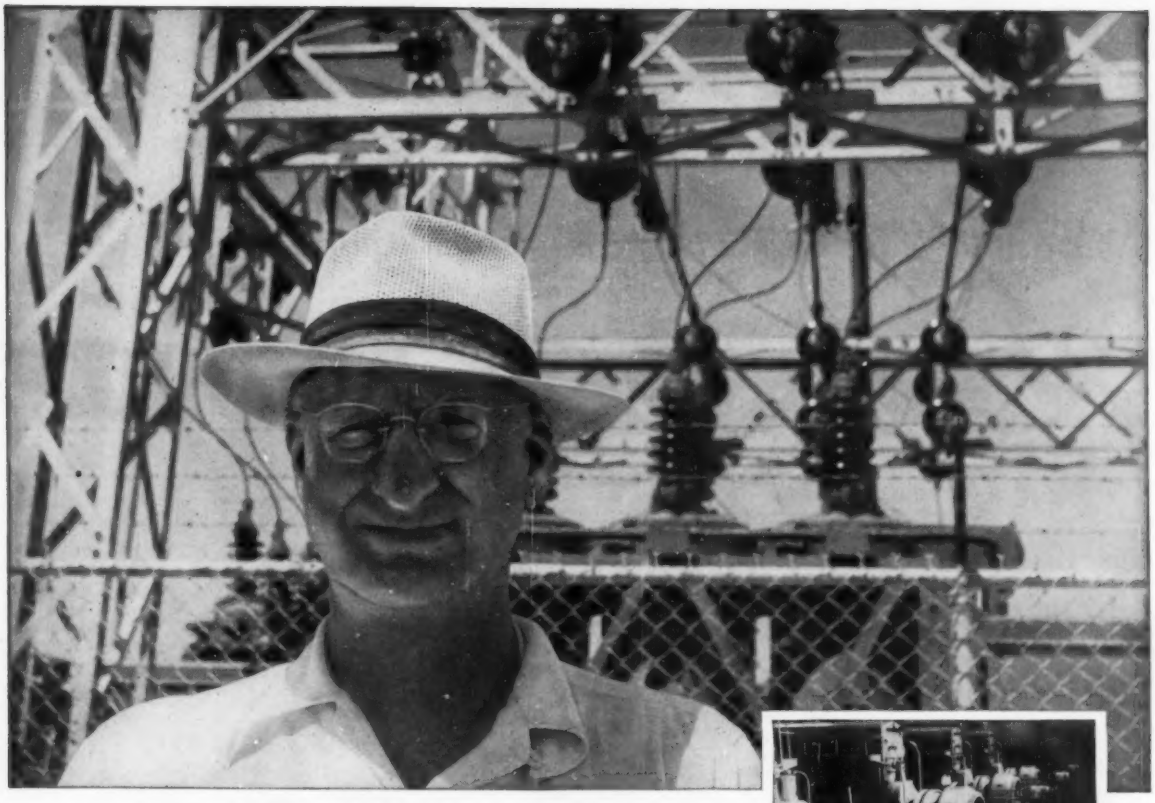
View of the stock room at the Palisades Park plant, where replacement parts for Farris Pickering Governors are kept constantly available.

Precision Speed Controls Since 1862

Farris PICKERING GOVERNOR CO., INC.

Palisades Park, N. J., U. S. A.

Affiliates: FARRIS ENGINEERING CORP. • FARRIS FLEXIBLE VALVE CORP. • FARRIS STĀCON CORP.
FARRIS HYDROTORQUE CORP. • FARRIS HYDROSEAL CORP.



POWERFUL GUY!

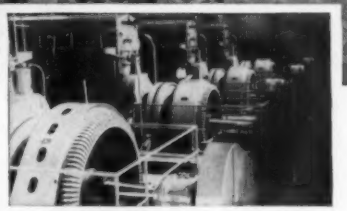
His four Nordberg Diesels, lubricated by Cities Service DC-940 Oil, supply six Oklahoma Counties with REA power. Have one of lowest cost-per-KWH records of entire REA.

His name's H. P. Wingo, and he's Chief Engineer of the REA plant operated by Western Farmers Electric Cooperative.

For the past four years, since his plant began operation in Woodward, Oklahoma, he's been responsible for a consistently high power efficiency rating, measured in cost per kilowatt hour...as high as fifth among all 42 REA plants! To maintain this record, he's had important help... help from four 1100 KW Nordberg dual-fuel engines...and help from Cities Service DC-940 Oil.

"Our engine compressions are the same today as they were after the first three months' operation," says Wingo. "In addition, using Cities Service DC-940, rings have remained absolutely free, liners have worn less than .0015, and we average 14,000 horsepower hours per gallon of oil. Filter elements last up to 1,500 hours."

Wingo has added his words of praise to those of scores of other users of Cities Service Lubricants. Summed up, these reports clearly demonstrate that superior performance is not the exception, but the rule, with Cities Service products. Your Cities Service Lubrication Engineer can readily explain why. Talk it over with him. Or write: Cities Service Oil Company, Sixty Wall Tower, New York 5, N. Y.



4 NORDBERGS, 4 YEARS OLD ... yet engine compression remains the same as after first three months of operation at Western Electric REA Plant, Woodward, Okla. Rings "absolutely free," liners worn less than .0015, oil consumption at 14,000 H.P. hrs. per gallon using Cities Service DC-940 Oil.

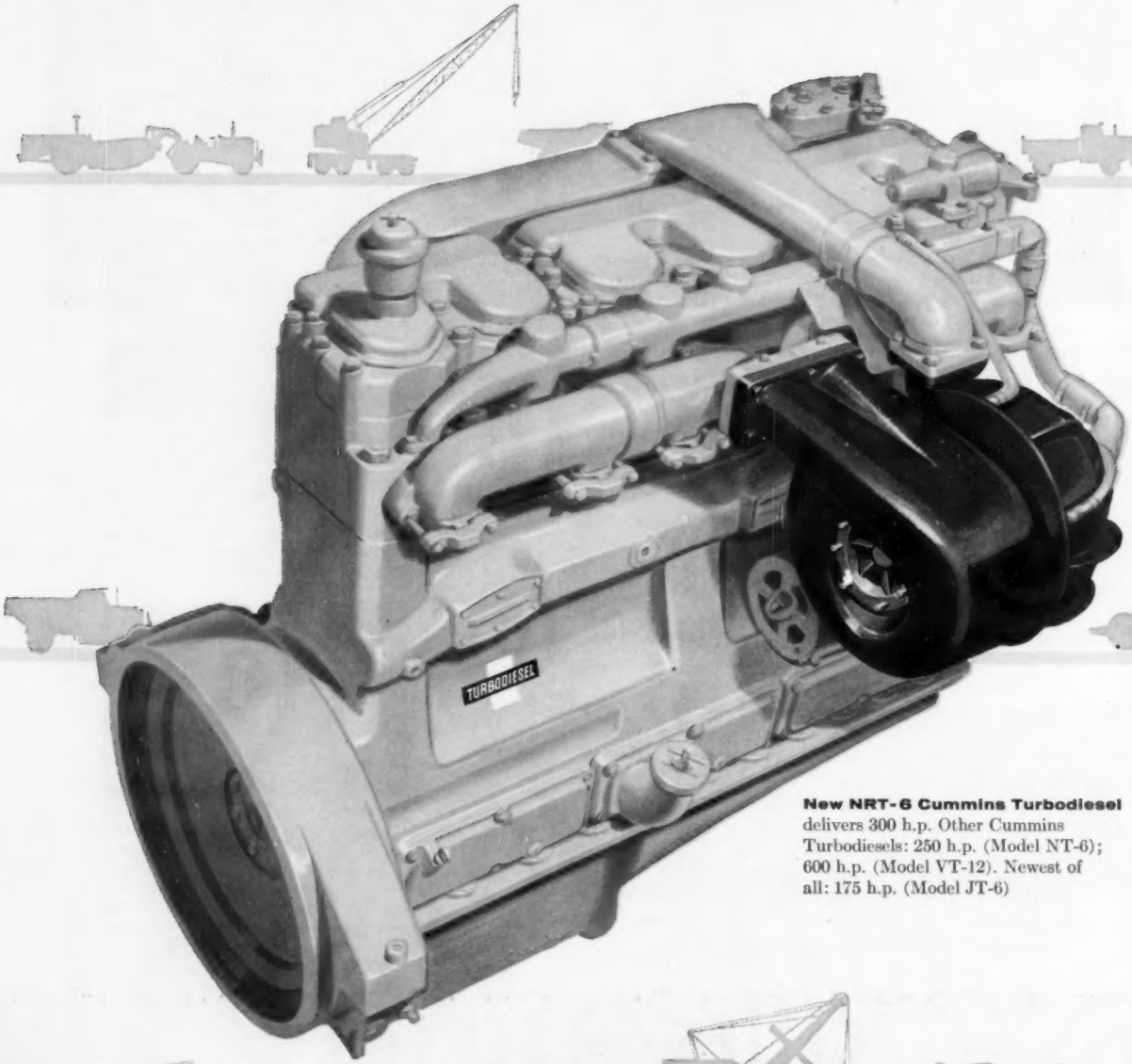
CLOSE CHECK is kept on entire operation. Meanwhile, Cities Service Lubrication checks wear in Nordberg engines, helps engineer Wingo maintain record of low cost electricity. Supplying economical power to six Oklahoma Counties, plant's power efficiency rating has been as high as 5th in entire REA.

CITIES SERVICE

QUALITY PETROLEUM PRODUCTS

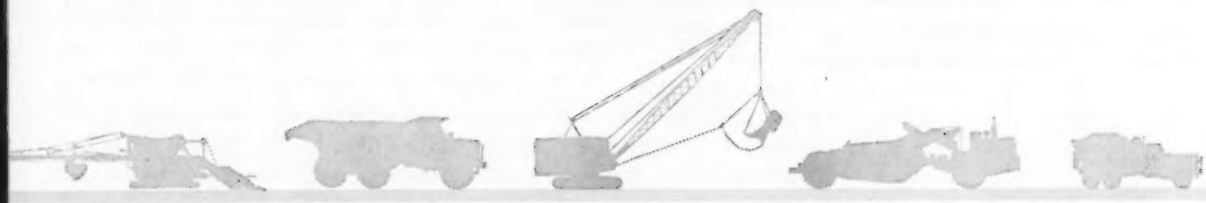
Now available for all kinds of construction equipment...

NEW CUMMINS



New NRT-6 Cummins Turbodiesel delivers 300 h.p. Other Cummins Turbodiesels: 250 h.p. (Model NT-6); 600 h.p. (Model VT-12). Newest of all: 175 h.p. (Model JT-6)

TURBODIESELS



POWER!.....PERFORMANCE!.....PROFIT!

Here's a new power concept to make *your* construction jobs more profitable. Cummins Turbocharging brings you extra diesel horsepower without added engine weight by harnessing the energy in normally wasted exhaust gases . . . boosting engine efficiency.

Field tests on all kinds of construction jobs show significant savings in time, fuel and equipment. And like all Cummins Diesels, the new Turbodiesels feature the simple to understand and service PT fuel system and easy-as-gasoline maintenance. Added time-saving economy feature for construction men: special service and parts availability on job sites is arranged by your local Cummins distributor to serve *your* needs.

No wonder *more and more construction men today are standardizing on Cummins Diesels.*

CUMMINS diesels give you the big plus **MORE PROFIT**

Cummins Engine Company, Inc.
Columbus, Indiana

I am interested in finding out more about the advantages of Cummins Turbodiesels. Please send me:

_____Your directory of manufacturers offering Cummins Diesels in their equipment.

_____Your booklet illustrating Turbodiesel principles.

I am interested in converting my present equipment to Turbodiesel power.

_____Please have your representative call.

Name_____

Position_____

Company_____

City_____ State_____

DI-7

Random Thoughts from a Filter Engineer

by J. P. Van Sweringen

- **PUTTING A QUART IN A PINT BOTTLE**
- **WHY SOME CATALOGS ARE ALWAYS OUT-OF-DATE**
- **THAT SOMETHING INVISIBLE THAT COMES WITH EVERY FILTER**

PUTTING A QUART IN A PINT BOTTLE

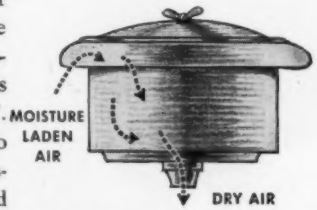
More than a few times we've been called in to provide a filter for an engine when there wasn't enough space to install a filter with adequate capacity. As a result, a filter with less than desired capacity had to be used. But even when this smaller filter manages to handle more air than it was designed for, results are not entirely satisfactory. The filter has to work too hard. And filters, like automobiles, operate more efficiently when not always run at "top speed".

It never pays to try to put a quart in a pint bottle. The best way to avoid the big engine–small filter problem is to consult a filter engineer *before* you build that engine. Most filter problems can be solved when you're in the preliminary stages of designing an engine.

WHY SOME CATALOGS ARE ALWAYS OUT-OF-DATE

I wonder if you ever had this happen to you: you plan a catalog carefully, make sure it is *complete,* then almost before it reaches your customers it's already out-of-date. It's happened to us. Even with the hundreds of filters we make, there's always some new filter problem which requires a *new* filter to solve it best.

One problem that called for a new filter was dumped into our laps the other day by an owner of some sensitive measuring instruments. He wanted us to dry some "wet air". The problem was not to remove droplets of moisture. For years we've had filters that could do this. He wanted us to build a special filter that would remove "wet air", air that was moist but not humid enough to form droplets.



Well, we designed an open-to-the-air model that did the trick. Air goes under a hood, passes through a dessicant cartridge, then out the base of the filter to the instrument chamber. Tests showed that the air was virtually moisture-free. We had removed the humidity.

So if you don't see what you want in our catalog, ask for it. We may have a unit that will fit your needs. Or where sizeable quantities are involved we'll be glad to engineer a filter for you. We have 30 years experience engineering filters that solve special problems.

THAT SOMETHING INVISIBLE THAT COMES WITH EVERY FILTER

When you buy a product—be it a small filter or a large generator—you usually take for granted the service that comes along with it. Product features often obscure service to the extent that it isn't even mentioned before the sale is made. Yet service is the great unseen part of a product . . . the part that guarantees that the product performs at its best.

Map shows 83 Air-Maze representatives.

When you buy filters from Air-Maze, quick service is as near as your phone. Our trained representatives are located in 83 cities across the nation. They stand ready with friendly, competent help, whenever you need it. The Air-Maze Corp., 25000 Miles Rd., Cleveland 28, Ohio.

AFI MEMBER AIR FILTER INSTITUTE

AIR-MAZE

The Filter Engineers

AIR FILTERS • SILENCERS • SPARK ARRESTERS
LIQUID FILTERS • OIL SEPARATORS • GREASE FILTERS

Contractor's 120-Truck Fleet uses VANASIL PISTONS 100%

G. A. YOUNG, VICE PRES.
J. T. G. PASELK, TREAS.

CLEMENTS CONSTRUCTION CO.
CONTRACTORS
210 SEQUOIA RD. • P. O. BOX 667 • CENTERVILLE 8-8306
CENTERVILLE, CALIFORNIA

RONALD D. COATS, PRES.
H. STAVERT, SECY.

April 22, 1955

Gillett & Eaton, Inc.
Lake City, Minn,

Gentlemen:

About two and a half years ago we began using your Vanasil Pistons in our heavy duty trucks and pickups. Their performance is so far superior that at the present time our entire fleet of more than 120 trucks is Vanasil equipped.

We have noticed a very definite improvement in the operation of every truck and engines are running many more miles between overhauls. When the engines are reconditioned after much longer use, we find no excessive piston or top ring groove wear and little cylinder wall wear.

It is difficult to get an accurate gasoline consumption check with our type of operation, but everyone including the drivers feels that we are getting better gas milage and also low oil consumption.

But to our complete satisfaction with the performance of Vanasil Pistons, we are now installing them in our stationary engines and tractors as they come due for overhaul.

Very truly yours,

George A. Young

George A. Young
Vice President

Clements Construction V.P. George Young reports:

- ★ **Better engine performance**
- ★ **More miles between overhauls**
- ★ **Less top ring groove, cylinder wall wear**
- ★ **Better gas and oil economy**

HERE'S DIESEL PERFORMANCE!

Denver—90,000 miles
in a 300 H. P. Cummins Diesel—and Vanasil Pistons were found to be perfect when engine was disassembled.

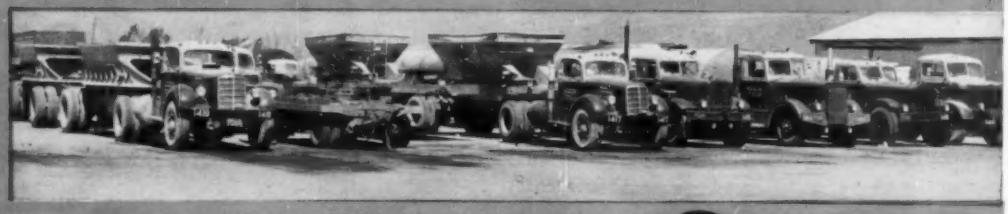
Ft. Bragg, Cal.—83,750 miles
in truck No. 23 with Cummins NHRS 300 engine. "Miking" the pistons showed no wear and ring grooves were perfect. Vanasil Pistons were put back in service with a new set of sleeves and rings.

(Names of above operators on request.)

G & E VANASIL PISTONS

are as light as aluminum, but wear like iron! Vanasil is a patented silicon-aluminum alloy that absorbs oil—minimizes scoring and scuffing. Available for both gasoline and diesel engines. Write for price lists and the complete Vanasil story.

Offices—Clements Construction Co. Centerville, Calif.



Part of Clements 120-Truck Fleet 100% equipped with Vanasil Pistons

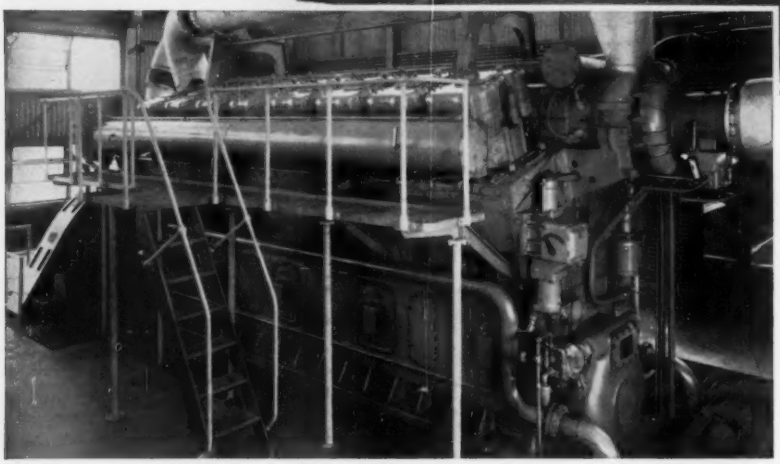
VANASIL Piston Warehouse Stocks:

CALIFORNIA	Automotive & Industrial Whse. Co., 1341 So. Hope St., Los Angeles 15 Piston Supply Warehouse, 2768 Grove St., Oakland 12
COLORADO	Denver Bearing Co., 780 Lincoln St., Denver 2
NEW YORK	Bethlehem Equipment Co., 109 W. 64th St., New York 23

Established G&E 1868

GILLETT & EATON, INC.
846 Doughty St. • Phone 6201 • Lake City, Minn.

Cooper-Bessemer Flexibility Helps M & A Green Forest Plant Win "Top-Rated" Honors



Another Example of Efficient Power at Lower Cost

Here's one of the four Cooper-Bessemer LSV's that furnish dependable, low cost power in M & A's award winning Green Forest Plant.

• FOR THE FOURTH SUCCESSIVE YEAR the Diesel Progress annual award for the most efficiently operated REA internal combustion plant goes to a Cooper-Bessemer powered station . . . M & A Electric Power Cooperative's Green Forest Plant near Poplar Bluff, Missouri.

Here, four 16-cylinder Cooper-Bessemer LSV engines, each rated 3300 hp at 327 rpm, helped win the coveted bronze plaque by producing 58,945,000 kw. hours at a net cost of only 6.41 mills per kilowatt hour.

Even with varying combinations of fuel, and changing power load demands, these Cooper-Bessemer engines offer reliable performance and long-lasting economy. In part, this is done through automatic controls, utilized to quickly, economically convert from gas-diesel to oil-diesel in the event of low gas pressure, and back again to gas-diesel when normal pressure is restored.

Another feature of the M & A plant is the compact design of the Cooper-Bessemer V-type engines. *More* power can be concentrated per square foot of floor space for less extensive, less expensive engine foundations. For further information on heavy-duty Gas-Diesel, Diesel or Gas engines, contact the nearest Cooper-Bessemer office.

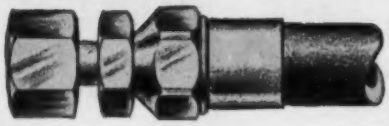
MOUNT VERNON, OHIO
COOPER-BESSEMER
GROVE CITY, PENNA.

New York City • Seattle, Wash. • Bradford, Pa. • Chicago, Ill. Houston, Dallas, Greggton, Pampa and Odessa, Texas Washington, D. C. • Shreveport, La. • San Francisco, Los Angeles, Calif. • St. Louis, Mo. • Gloucester, Mass. • New Orleans, La. • Tulsa, Okla. • Cooper-Bessemer of Canada Ltd., Edmonton, Alberta—Halifax, Nova Scotia.

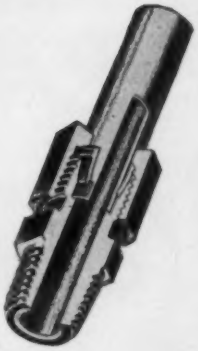
don't risk "DOWNTIME"

install WEATHERHEAD for vital connections

ERMETO® connectors



Patented Ermeto design means positive, leakproof, vibration-resistant tube connections. You need only a wrench to make a seal that is good for life of tube. Joint can be disassembled and reassembled. Ermeto connectors are available in steel or stainless steel, for low or high pressure requirements.

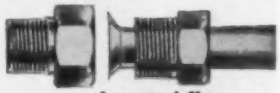


Brass fittings

S. A. E. 45° flare

Weatherhead brass fittings are machined from extruded stock, giving strength equal to forgings. Large, flat wrench pads provide easy gripping for fast assembly, even in hard-to-reach places. Because Weatherhead's line is complete, you can order all your requirements from one supplier.

Compression

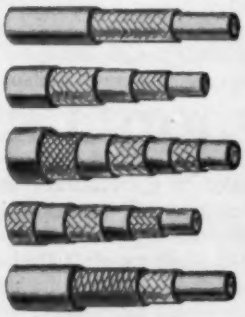


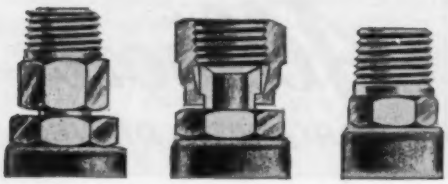
Inverted flare

Double compression (threaded sleeve)

Industrial Hose and Reusable ends

Weatherhead hose and reusable ends handle on-the-job repairs, saving both time and money. Hose ends are designed for fast, easy attachment and perfect fit assures leakproof connections. Rugged construction allows repeated use. Weatherhead offers hose in sizes from ¼" to 2" for low, medium, medium-high and high pressure applications.





Weatherhead has served the "lifelines of industry" for 36 years, earning the confidence of the nation's leading manufacturers. This reputation has been achieved through constant care for quality standards and improvement of technical skills and facilities. When you buy Weatherhead, you buy dependability.

For more information on Weatherhead industrial and automotive products, address: The Weatherhead Co., Dept. B-5, Ft. Wayne Division, 128 W. Washington Boulevard, Ft. Wayne, Indiana.

WEATHERHEAD

is showing the way

For rolling pavements

or towing planes

take this TORQMATIC tip

THERE'S A big difference between these two pieces of equipment but they've got one thing in common—their Allison TORQMATIC Converter-Continental Engine team.

In the Galion Roll-O-Matic roller, TORQMATIC power transmission provides a complete hydraulic cushion that makes for really smooth pavements. It means no gears to shift, quicker pickup, 10% more work per day with fuel consumption cut as much as 25%.

And in the Unitow Industrial Tractor it means smoother, steadier towing of huge bombers and commercial planes —that will not damage even the most fragile nose-wheel strut.

Allison's small, compact, *completely self-contained* 200-300 Series TORQMATIC Converters fit *both* gasoline and Diesel engines in the 40 to 150 horsepower range. They bring shock-free power transmission to a wide range of equipment—protect the entire drive line from harmful shock loads. They more than *triple* engine torque—broaden the engine's working horsepower range.

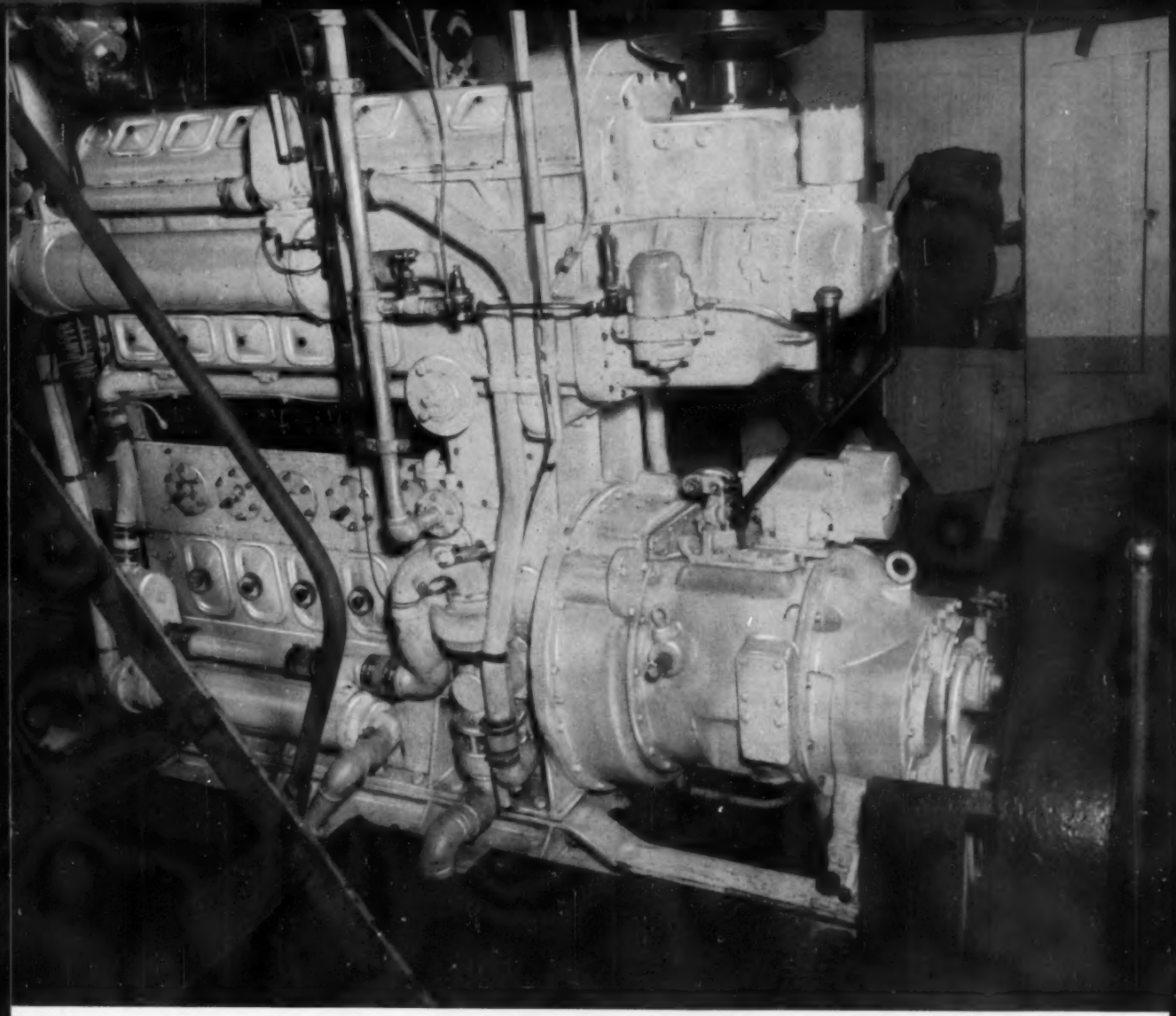
These converters are easy to maintain, too. They carry their own oil supply—have a simple dip stick to check oil level. They are the first complete converter package in these sizes on the market with integral oil cooler, sump and charging pumps. Many model options including front or rear disconnect clutches, governor drives and optional flanges designed to meet most installation requirements are available.

You can *specify* Allison TORQMATIC Converters or Transmissions in a wide range of equipment from road rollers to giant off-highway trucks. Ask your equipment dealer or manufacturer about TORQMATIC DRIVES next time you buy, or write direct for more complete information. Allison Division of General Motors, Box 894S, Indianapolis 6, Indiana.

GM TORQMATIC

Allison

TORQMATIC DRIVES



More Cargo...Faster with an Opposed Piston Engine

Listen to what "Repowering with O-P" has done for the motor tanker, *Lucy*.

Her 375-horsepower Model 38F Opposed Piston Diesel weighs 34 tons less than the engine replaced—that's equivalent to more than 200 barrels' capacity that can be added every trip without affecting her design characteristics.

And her speed has been increased 25%, making it possible to increase the number of revenue trips per month. In addition to increased cargo and speed adding to *The Lucy's* earnings, the Opposed Piston's 7% lower fuel oil consumption adds a bonus saving.

Increased earning capacity and proved low maintenance established by more than 6 million installed horsepower is proof of what an O-P engine can do for your boat. See your nearby Fairbanks-Morse Marine Specialist and ask about the Opposed Piston engine that fits your repowering needs from 200 to 1200 horsepower. You'll find out the full meaning of *Better* Power for You . . . with an Opposed Piston Diesel Engine. Fairbanks, Morse & Co., 600 South Michigan Avenue, Chicago 5, Illinois.

FAIRBANKS-MORSE

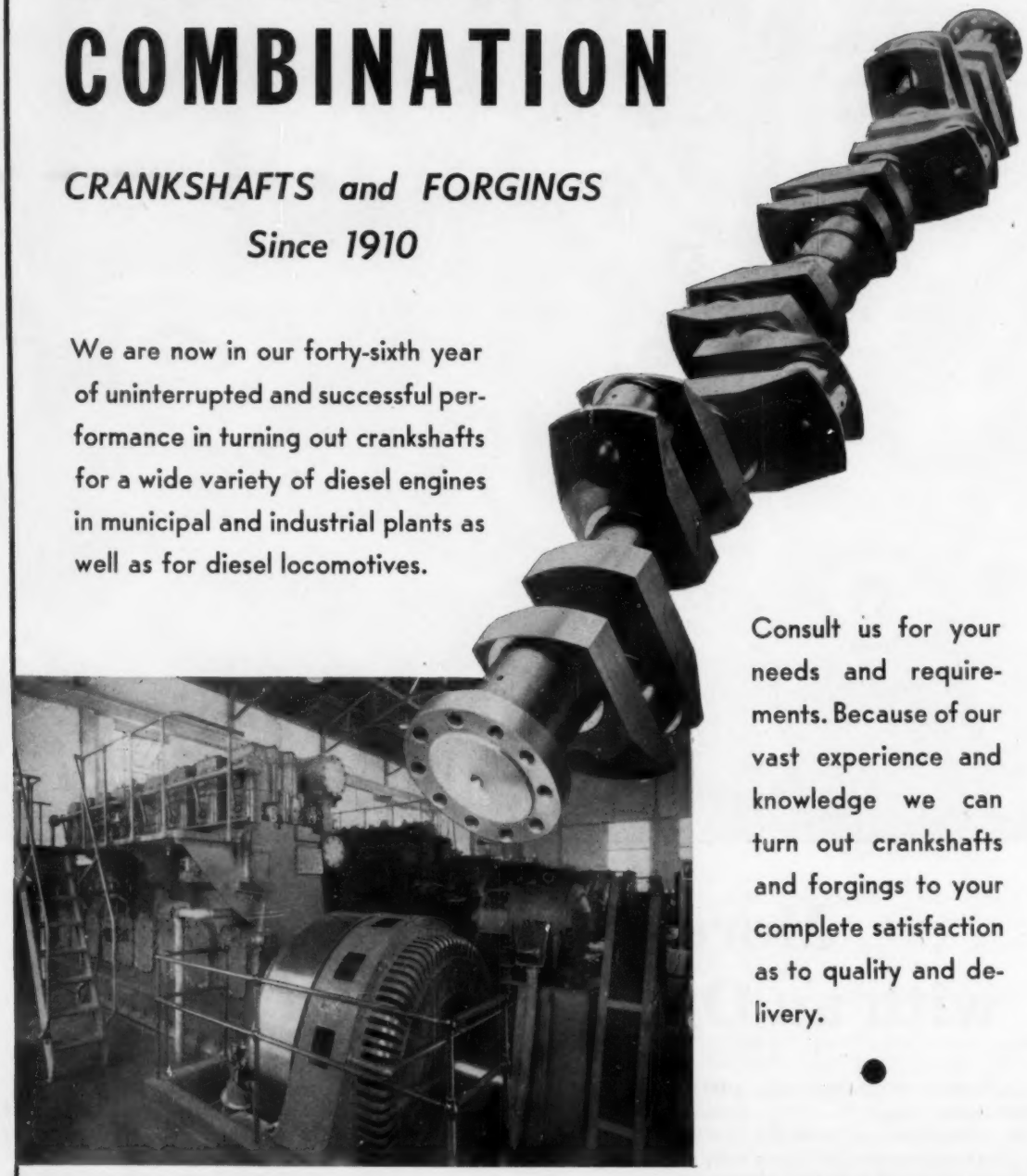
a name worth remembering when you want the best

DIESEL AND DUAL FUEL ENGINES • DIESEL LOCOMOTIVES • RAIL CARS • ELECTRICAL MACHINERY • PUMPS • SCALES • HOME WATER SERVICE EQUIPMENT • MOWERS • MAGNETOS

A SUCCESSFUL COMBINATION

CRANKSHAFTS and FORGINGS
Since 1910

We are now in our forty-sixth year of uninterrupted and successful performance in turning out crankshafts for a wide variety of diesel engines in municipal and industrial plants as well as for diesel locomotives.



Consult us for your needs and requirements. Because of our vast experience and knowledge we can turn out crankshafts and forgings to your complete satisfaction as to quality and delivery.

ELLWOOD CITY FORGE COMPANY
CRANKSHAFTS • CONNECTING RODS • MACHINE FORGINGS
ELLWOOD CITY, PENNA.

A New PM TOOL for Diesel and Gasoline Engines

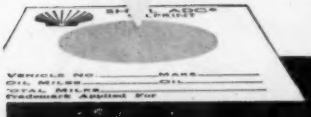
SAVE Time, Money, Oil and Engines with the Shell ADC* Oilprint Analysis

Now—operators can test crankcase oil in the short time allotted for re-fueling and oil level checks. The Shell ADC Oilprint Analysis gives a practical and accurate oil evaluation in minutes.

ADC Oilprint Analysis means big savings when used in your preventive maintenance program . . . gives valuable information on engine and oil conditions. It answers the question "When do I change my oil?" thus eliminating the draining of usable oil and the risk of using oils loaded with contaminants.

See for yourself how the new Shell ADC Oilprint Analysis can save you real money in preventive maintenance. *Trademark

Let us demonstrate how you can use this Service for Your Equipment



SHELL OIL COMPANY

50 WEST 50TH STREET, NEW YORK 20, NEW YORK
100 BUSH STREET, SAN FRANCISCO 6, CALIFORNIA

The towboat, *Crane*, is shown pushing loaded coal barges into the Ohio River at Pittsburgh on the way to Ohio Valley Electric Company's Kyger Creek Power Plant. St. Louis Shipbuilding Company built the *Crane* and sister ship, *Mike Creditor* . . . will finish a second sister ship, *A. L. Long*, for June commissioning.

Ohio River Company calls for more when

Baldwin Diesel power proves efficient on M/V "A. H. Crane"

Performance of twin Baldwin Diesels on their M/V *A. H. Crane* showed Ohio River Company that Baldwin Diesel power is efficient, dependable, economical. They came back for more. Now the *Crane's* Baldwins are duplicated on the *Mike Creditor* (commissioned in February) and the *A. L. Long* (commissioned in June).

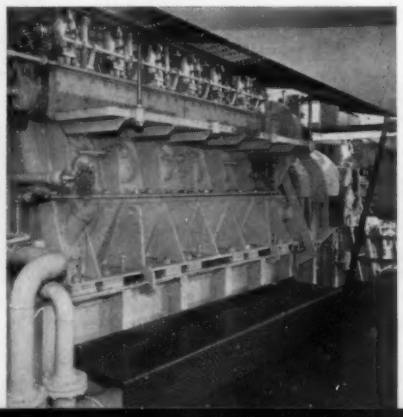
The *Crane* easily handles tows equivalent to 360 fifty-ton railroad coal cars (twenty 1000-ton barges) at a minimum fuel cost. Maintenance has been no problem at all.

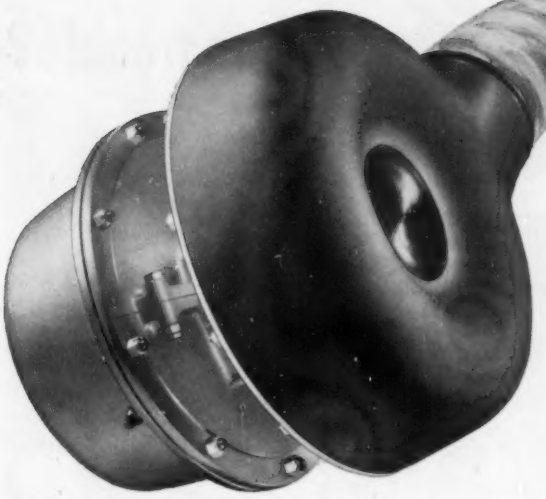
Find out how *you* can tow more, spend less with Baldwin Diesel power. Write us today for complete details!

Hamilton Division • Hamilton, Ohio

BALDWIN-LIMA-HAMILTON

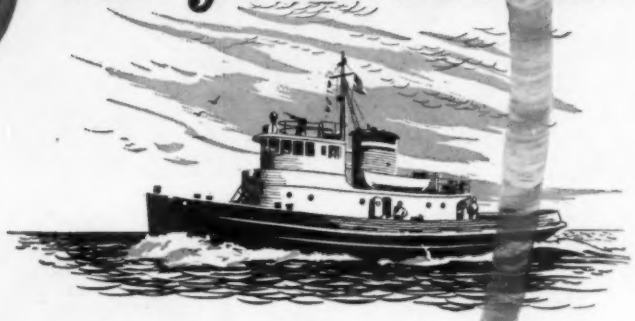
The Crane's two 6-cylinder, 4-cycle, 12¾ x 15½ turbocharged Baldwin Diesels each develop 1080 hp at 625 rpm. Their low weight per horsepower, rugged construction and high efficiency over a wide range of output make possible constant peak performance at low operating cost with minimum maintenance.

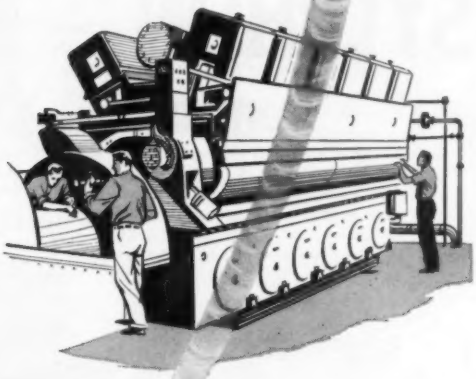




MORE DRIVE

for your diesel!





Here is how the application of AiResearch Turbochargers can affect the performance of your mobile or stationary diesel equipment:

✶ Adds more power in relation to size and weight than any other units in this field.

✶ Decreases fuel consumption. Besides decreasing costs, this factor greatly increases the non-refueling range for mobile equipment.

✶ Provides power as needed by responding rapidly to acceleration requirements. This factor greatly decreases smoking.

✶ Maintains sea-level power under all altitude conditions.

✶ Greatly reduces the noise level of your equipment while eliminating power-wasting mufflers.

AiResearch is the largest producer of small turbomachinery in the United States. Twenty-five *million* hours of experience in deriving exceptional power from small units is the background for the development of the AiResearch Turbocharger. This power package was recently applied to Caterpillar diesel machinery with startlingly effective results.

Your inquiries are invited.

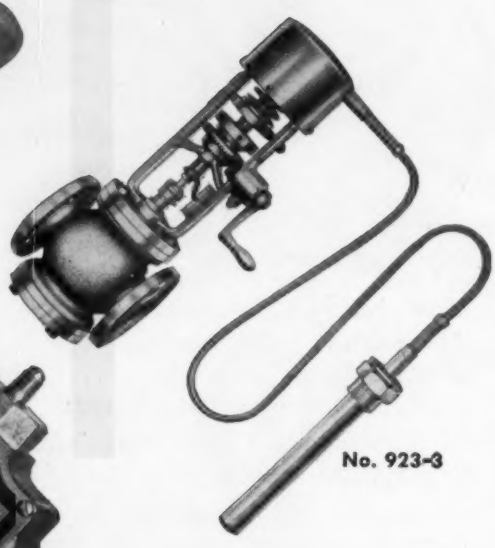
THE GARRETT CORPORATION

AiResearch Industrial Division

9225 Aviation Blvd., Los Angeles 45, California

DESIGNERS AND MANUFACTURERS OF TURBOCHARGERS AND RELATED MACHINERY

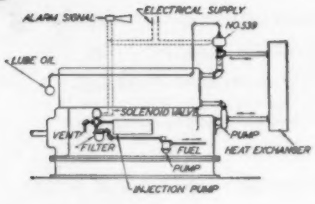
Why take chances on engine trouble?



No. 923-3

Depend on SYLPHON controls

No. 539



Typical installation of No. 539.

YOU NEVER NEED to cross your fingers—or trust to luck—with these Sylphon controls. When they're on the job, they safeguard you against engine trouble—day and night. They help ward off costly shutdowns, damage or repairs.

No. 539 control gives positive protection against high jacket water temperature or low lube oil pressure. If water jacket temperature goes above, or lube oil pressure goes below safe limits, it sounds an alarm—or shuts off the engine. Also available for temperature or pressure only.

No. 923-3 Regulator is equally dependable. It thermostatically controls cooling water circulation—keeps engine jacket temperature right. Can be manually operated—if and when desired!

Both controls are ideally suited to diesel, gas or other internal combustion engines. Self-contained and self-powered, they're built to give you long, trouble-free service. Easily installed. For complete information, send for Bulletin ND-817.

Robertshaw-Fulton
CONTROLS COMPANY

FULTON SYLPHON DIVISION

Temperature Controls · Bellows Devices · Bellows Assemblies

KNOXVILLE 1, TENNESSEE

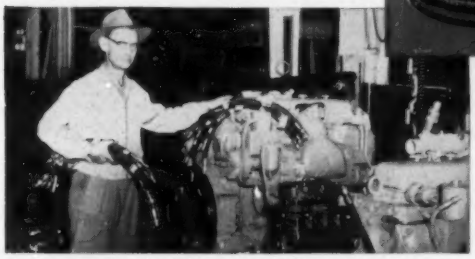
Louisville Transit Company Speeds Maintenance, Simplifies Engine Conversion with Aeroquip Bulk Hose and Fittings

A mechanic at Louisville Transit Company's heavy maintenance shop assembles hose lines to be used on diesel engine conversions.

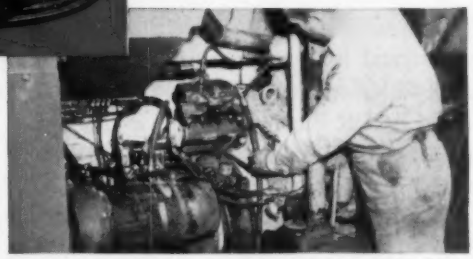
Louisville Transit Company, 4-times winner of *Bus Maintenance Awards*, has standardized on Aeroquip hose lines for shop maintenance and for diesel conversion engines.

Maintenance foreman Fred Mullins says, "Aeroquip is ideal for conversion and heavy maintenance work. We have 381 buses working and I have never seen an Aeroquip hose break or pull loose from fitting."

Make Aeroquip your replacement standard for diesel and gasoline fuel lines, too. See your distributor or write direct.



Foreman Fred Mullins holds a kit of 16 Aeroquip hose assemblies, used when converting Louisville buses from gasoline to diesel engine.



All fuel, air and water lines being installed on this diesel engine were made up from Aeroquip bulk hose and reusable fittings.

Aeroquip

REG. TRADEMARK

AEROQUIP CORPORATION, JACKSON, MICHIGAN

LOCAL REPRESENTATIVES IN PRINCIPAL CITIES IN U.S.A. AND ABROAD • AEROQUIP PRODUCTS ARE FULLY PROTECTED BY PATENTS IN U.S.A. AND ABROAD

cut your diesel maintenance costs with

PUROLATOR

in these three spots

Even the cleanest fuel supply brings damaging dust, dirt and grit into your diesel engine. Without filtration, injection pumps gall, wear and lose their accuracy. Nozzles get plugged and burn. Even if your engine goes on running, the power output of individual cylinders goes badly out of balance.

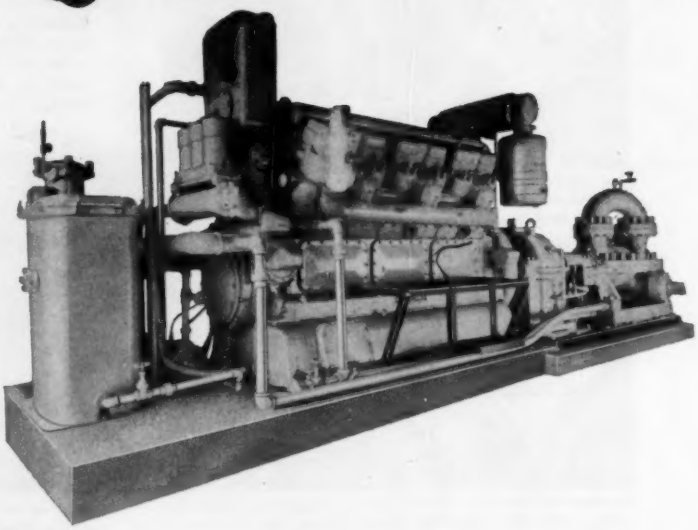
So . . . effective fuel oil filtration is absolutely essential. For your engine to keep running at peak efficiency and with minimum outlay for maintenance, its fuel system should be equipped with PUROLATORS in the three areas listed at the right.

For details of the PUROLATOR models designed for use in these diesel applications, write today for the PUROLATOR diesel catalog. Address Purolator Products, Inc., Rahway, N. J., Dept. DPI-711

Immediately before and after the transfer pump. The PUROLATOR on the suction side protects the pump. The one on the pressure side takes out any bits of metal worn from the moving pump parts.

In the fuel line before the injection pump. A PUROLATOR here is an inexpensive way to assure smooth, wear-free operation of the injection pump.

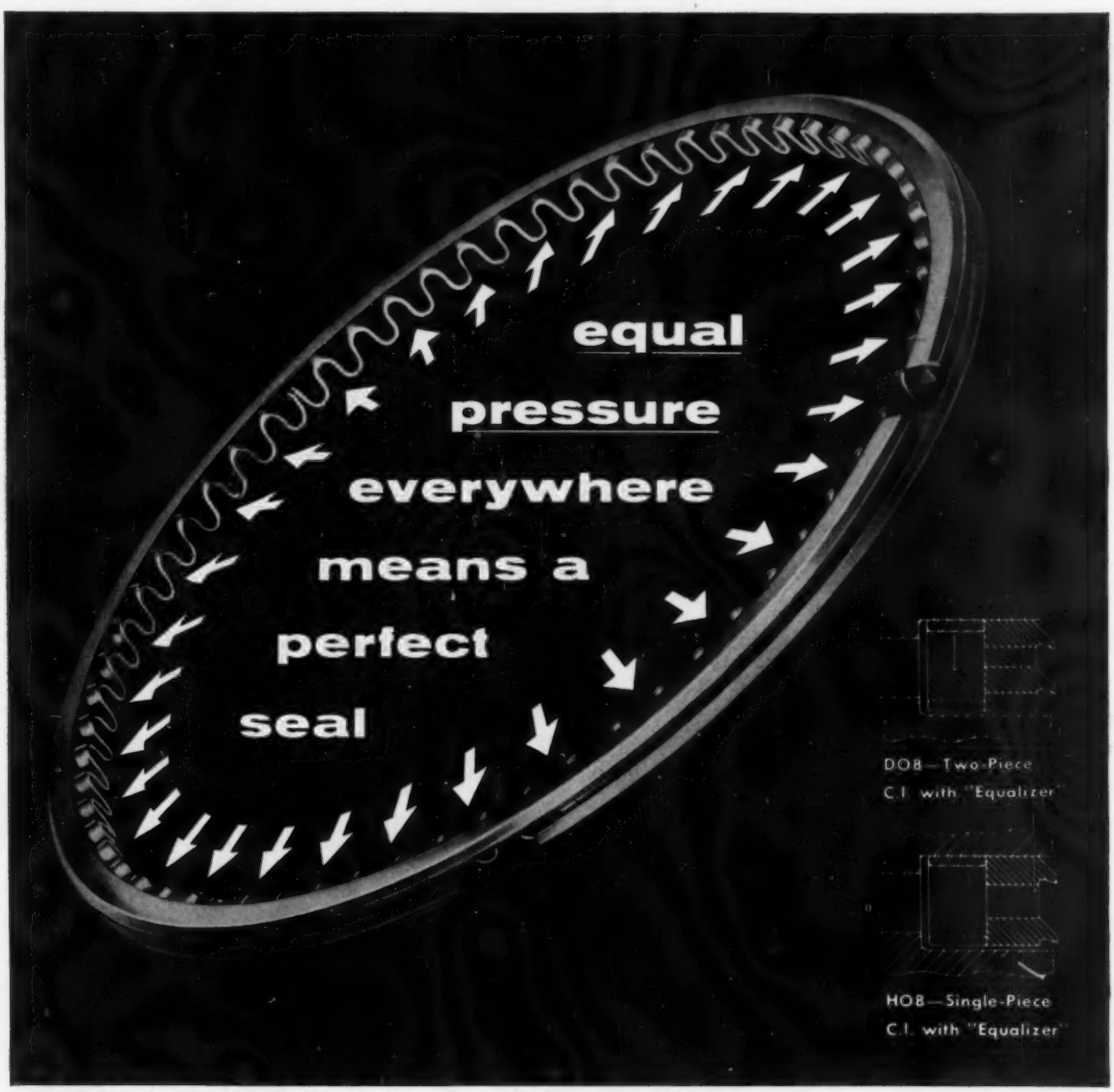
Built into each injection nozzle. While there is no obvious source of contamination beyond the injection pump, experience shows that an individual metal-edge filter element built into each nozzle assembly vastly improves nozzle life expectancy.



PUROLATOR

"FIRST IN THE FIELD OF FILTERING"

PUROLATOR PRODUCTS, INC., Rahway, New Jersey



PEDRICK PIONEERED CONFORMABLE OIL RINGS

A perfect seal, with uniform oil control for diesel and gas engines! Pedrick achieved it with the original *conformable* oil ring.

This is the design that made it possible: Two thin, flexible cylinder contacting sections are kept under absolutely uniform tension by the Pedrick "Equalizer." This exclusive feature provides a soft but positive and uniform pressure *all around the cylinder wall.*

The exceptional conformability makes possible more effective oil control with less unit pressure or ring friction. Cylinder and ring wear are reduced and engine overhaul periods are extended. Oil control stays constant for tens of thousands of hours. Carbon pollution is all but eliminated.

Whatever your requirements . . . single rings or engineered sets, it will pay you to insist on Pedrick. Engineering service is available to help you with special problems. Write, phone or wire: WILKENING MANUFACTURING CO., Philadelphia 42. SAratoga 9-3770.

Pedrick PISTON RINGS

PEDRICK PRECISIONEERING KEEPS PEDRICK FIRST

Address inquiries from U.S.A., Alaska, Hawaii and Puerto Rico to: DIESEL ENERGY CORPORATION, 82 Beaver Street, New York 5, N. Y. Certain territories open for distributors.

THE ENGINEER'S REPORT

DATA

LUBRICANT RPM Delo Oil R.R.

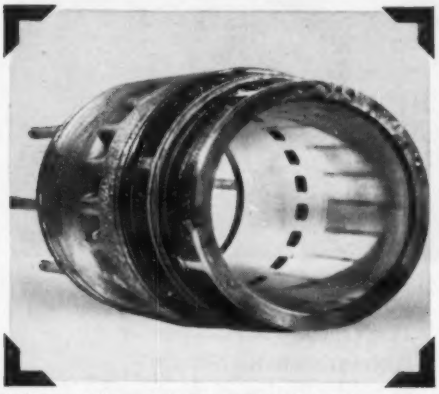
UNIT Diesel locomotive

SERVICE Mountain freight haul

CONDITIONS Long, continuous grades to 1.6%

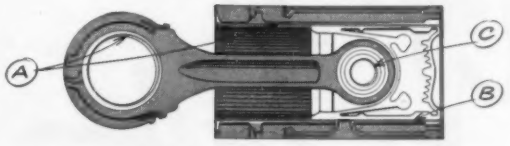
FIRM The Milwaukee Road

333,590 freight miles—only 0.0035 inch liner wear!



LUBRICATED WITH RPM DELO OIL R.R., this representative cylinder assembly was in good condition when pulled for regular inspection after 333,590 actual freight miles. Operation was on The Milwaukee Road's tough run between Othello, Washington, and Avery, Idaho. This liner, shown as it came from the engine, miked only 0.0035 inch wear, 0.001 inch taper, despite hard operating conditions—heavy loads, wide temperature variations, heavy grades, including one stretch of 20 miles of continuous 1.6 percent. Neither wristpin or bushing showed measurable wear.

How RPM DELO Oil R.R. prevents wear, corrosion, oxidation



A. Special additive provides metal-adhesion qualities...keeps oil on parts whether hot or cold, running or idle.

B. Anti-oxidant resists deterioration of oil and formation of lacquer...prevents ring-sticking. Detergent keeps parts clean...helps prevent scuffing of cylinder walls.

C. Special compounds stop corrosion of any bushing or bearing metals and foaming in crankcase.

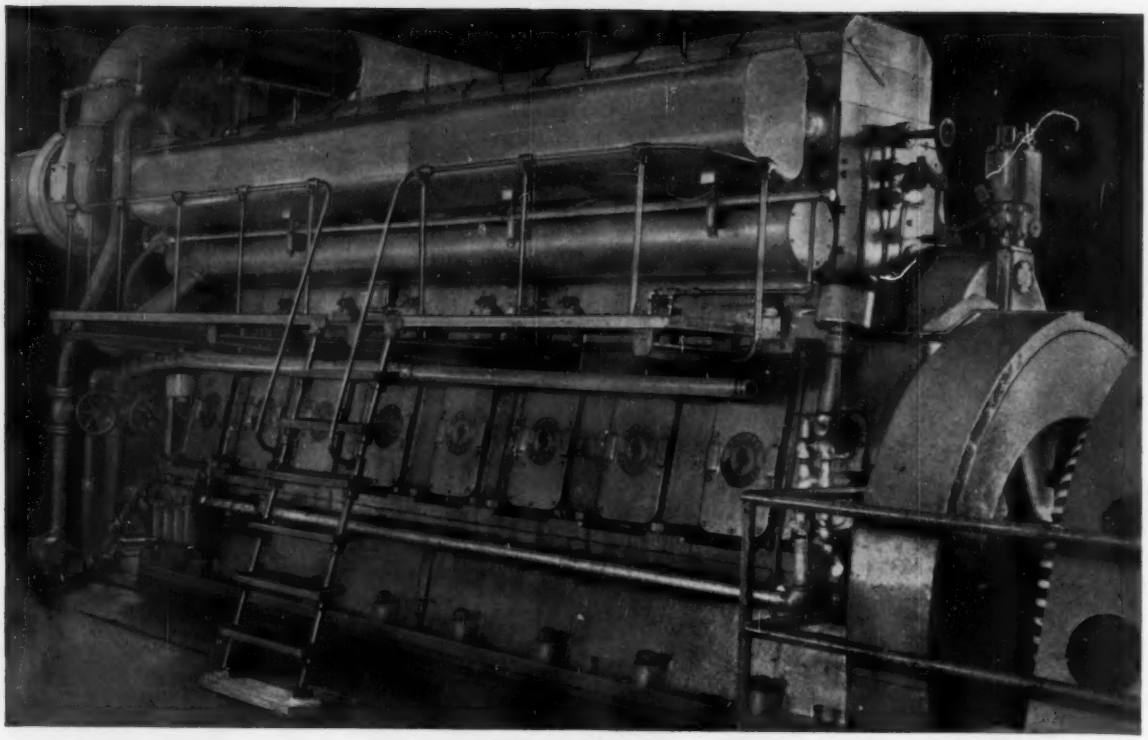
FREE CATALOG: "How to Save Money on Equipment Operation," a booklet full of valuable information, will be sent you on request to Standard Oil Company of California, 225 Bush St., San Francisco, Calif.

RPM DELO LUBRICATING OILS

FOR MORE INFORMATION about this or other petroleum products of any kind, or the name of your nearest distributor handling them, write or call any of the companies listed below.

TRADEMARK "RPM DELO" REG. U.S. PAT. OFF.

STANDARD OIL COMPANY OF CALIFORNIA, San Francisco 20 • STANDARD OIL COMPANY OF TEXAS, El Paso
THE CALIFORNIA OIL COMPANY, Barber, New Jersey • THE CALIFORNIA COMPANY, Denver 1, Colorado



Official U. S. Navy Photograph

CP Diesel Joins U.S. Navy

for lifetime duty!

That's right! When Chicago Pneumatic builds a diesel, it's built for a lifetime of dependable power performance and low operating cost. The CP diesel above supplies power at the U. S. Naval Station's power plant in Key West, Florida. Recently supercharged by Chicago Pneumatic, it has a capacity of 950 kw . . . delivers 1375 hp.

Chicago Pneumatic diesel, dual-fuel and gas engines are available in sizes ranging from 120 hp to 1750 hp in normally aspirated or supercharged models. For information on the size and model best suited for your specific power requirements, write *Chicago Pneumatic Tool Company, 8 East 44th Street, New York 17, N. Y.*

Chicago Pneumatic

PNEUMATIC TOOLS • AIR COMPRESSORS • ELECTRIC TOOLS • DIESEL ENGINES • ROCK DRILLS • HYDRAULIC TOOLS • VACUUM PUMPS • AVIATION ACCESSORIES

Plain Facts...

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CABLE ADDRESS
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DAROS AMERICAN CORPORATION

D. D. COOK
President

8128 NORTH LAWNDALE AVENUE
SKOKIE, (CHICAGO SUBURB) ILL., U.S.A.

DEAR MR. ENGINE OPERATOR

The cost of fuel represents 50 to 65% of the total cost of your engine operation. Piston ring leakage increases fuel cost 10 to 15%. This WASTE is not necessary—

Renewal or reboring worn cylinders can be postponed thousands of operating hours. Sealing rings are available that stop all leakage in worn cylinders.

Operating time between ring renewals can be increased 100 to 500%, reducing your maintenance expense.

Cylinder and ring wear can be reduced 50 to 90%, depending upon your selection of piston rings made of wear resisting material.

Daros make piston rings designed to correct these conditions, using special material and design needed for each type ring.

CAN YOU AFFORD TO IGNORE THESE FACTS?—

ONE DAROS INSTALLATION WILL CONVINCE YOU

Very truly yours,

D. D. Cook

EXCLUSIVE WHOLESALE DISTRIBUTORS IN NORTH, CENTRAL AND SOUTH AMERICA
DaRoS PISTON RINGS — DaRoS METALLIC ROD PACKINGS — DaRoS CYLINDER LINERS
MADE OF WORLD-FAMOUS SWEDISH CHARCOAL IRON BY
AB. DAVY ROBERTSONS MASKINFABRIK, GOTHENBURG, SWEDEN
ORGANIZED 1851

(This is ad #5 in a series designed to tell Diesel Operators the important story about DaRoS Swedish Iron Piston Rings.)

DaRoS American Corporation
8128 N. Lawndale Ave., Skokie, Illinois
Gentlemen: Send me complete information on DaRoS Rings.

NAME_____

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CITY_____ STATE_____

EATON
Valves and Bolts
FOR DIESEL ENGINES

Eaton Diesel engine parts combine the experience of many years as suppliers to the Diesel engine industry with the most modern precision production facilities—plus a thorough understanding of the problems peculiar to the Diesel engine field.

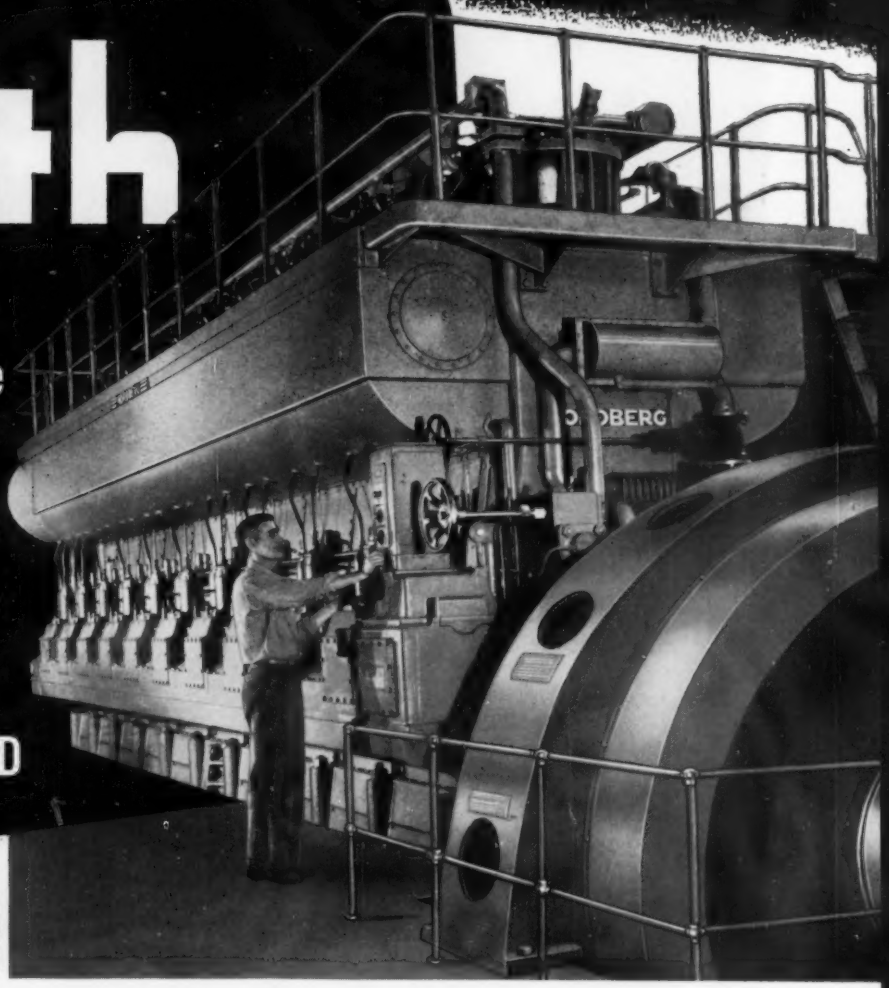
Eaton engineers will welcome the opportunity to discuss the application of Eaton Valves and Bolts to your engines.

EATON VALVE DIVISION
MANUFACTURING COMPANY
9771 FRENCH ROAD • DETROIT 13, MICHIGAN
General Offices: CLEVELAND, OHIO

PRODUCTS: Sodium Cooled, Poppet, and Free Valves • Tappets • Hydraulic Valve Lifters • Valve Seat Inserts • Jet Engine Parts • Rotor Pumps • Motor Truck Axles • Permanent Mold Gray Iron Castings • Heater Defroster Units • Snap Rings Springtites • Spring Washers • Cold Drawn Steel • Stampings • Leaf and Coil Springs • Dynamatic Drives, Brakes, Dynamometers

4th

NORDBERG Duafuel® Engine helps Garland, Texas keep pace with INCREASED POWER DEMAND



• One of the fastest growing towns in the United States, Garland, Texas is composed of over 17,000 progressive minded citizens. Just 14 miles northeast of Dallas, Garland is located in the heart of the north Texas rich blackland farming region.

In keeping with this rapid growth, and with an eye to the future, responsible officials have made sure that Garland's power plant has maintained a steady increase in capacity, to meet the ever-increasing power demand.

Backbone of Garland's efficient, economical power generation facilities are four reliable Nordberg Duafuel® Engines, installed at intervals to meet the increasing demand. The most recently installed unit is a 2-cycle, 10-cylinder Nordberg low pressure Duafuel® engine rated 4,580 hp, 3,500 kw, at 240 rpm. This fourth Nordberg repeat order was preceded by another 2-cycle low pressure Duafuel® unit rated 3,010 hp, 2,100 kw . . . and two 4-cycle supercharged Duafuel® engines each rated 1,200 hp, 855 kw.

Today, with four dependable Nordberg engines capable of generating over 7,000 kw, citizens of Garland can point with pride at the continued growth of their city and its power facilities.

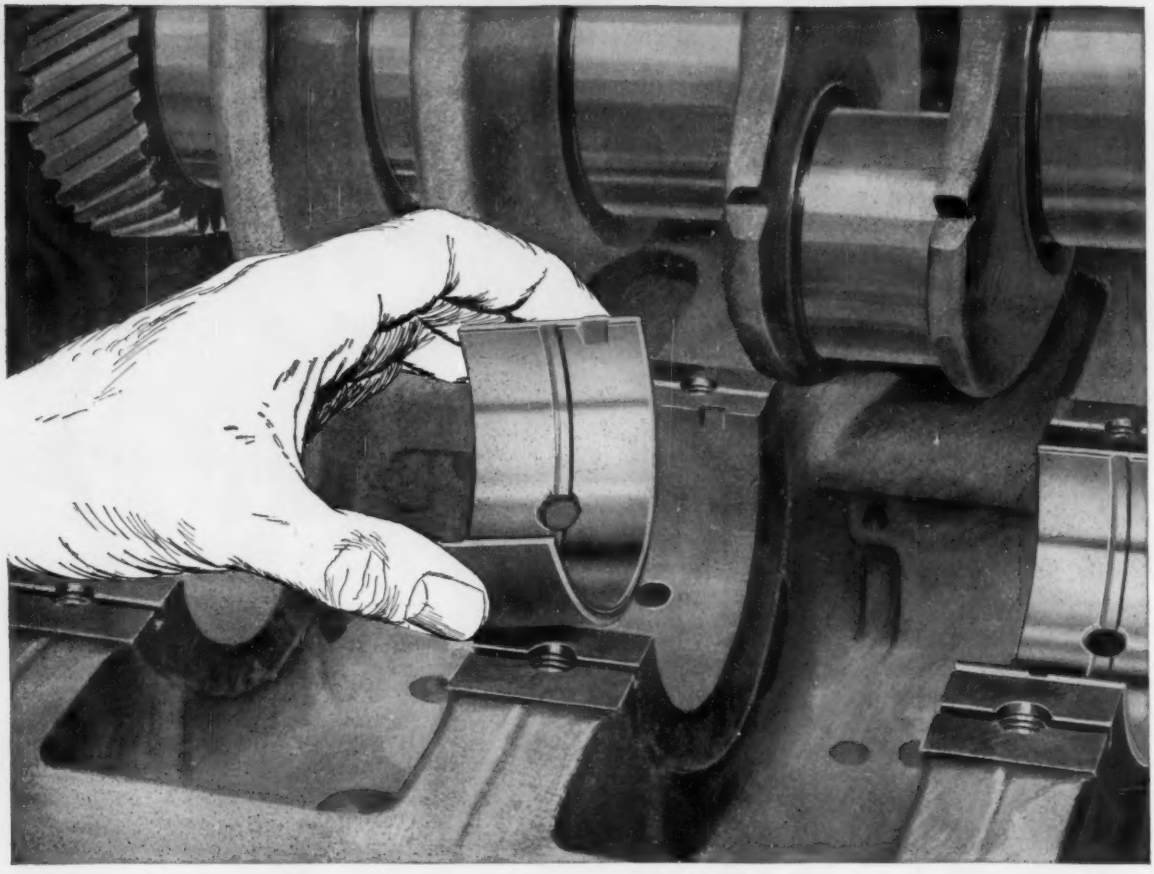
Next time you are thinking of power, think of Nordberg . . . builder of America's largest line of heavy duty engines, from 10 to over 10,000 horsepower.

NORDBERG MFG. CO., Milwaukee, Wis.

NORDBERG

DIESEL • DUAFUEL® AND SPARK-FIRED GAS ENGINES

P754



Why these bearings mean longer diesel life

● Clevite* 77 bearings are standard factory equipment in most heavy-duty diesel engines for all applications from stationary power to earth-moving and highway transport.

These bearings were designed to provide the higher fatigue strength and greater ability to dissipate heat which are essential in this service. They were designed, too, to provide a bearing surface that would not damage the costly shafts in these engines.

When your diesel engines need overhaul, be sure to replace bearings with Monmouth's* identical replacements... Clevite 77... available nationwide through N. A. P. A. jobbers. You'll get the same long life and dependable performance you had with the original.

*The words Monmouth, Clevite and Micro are registered trade marks of Clevite Corporation.

Monmouth

TRADE MARK

ENGINE BEARINGS

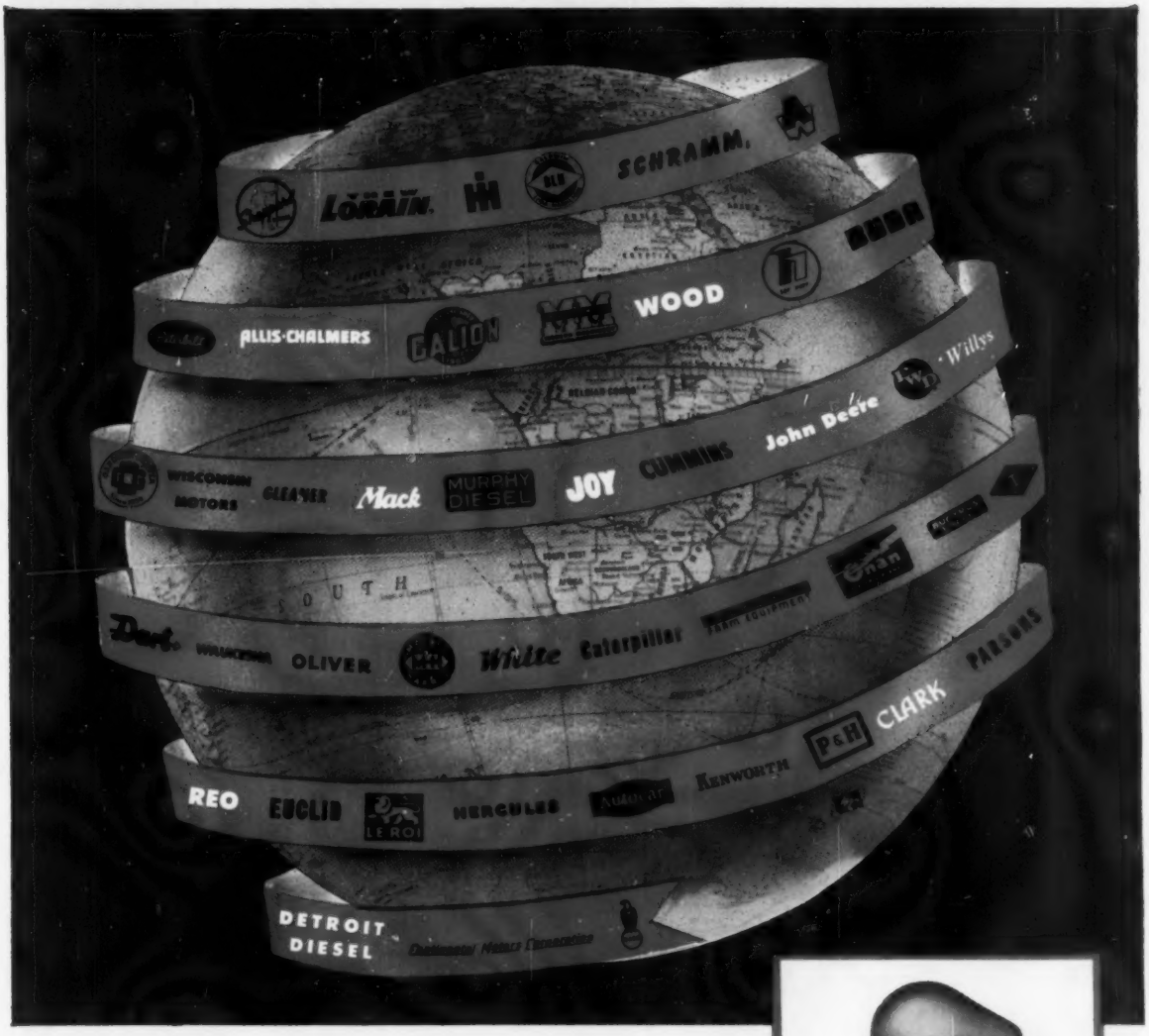
Clevite Service
The Cleveland Graphite Bronze Co.
Division of Clevite Corporation, Cleveland, Ohio, U. S. A.

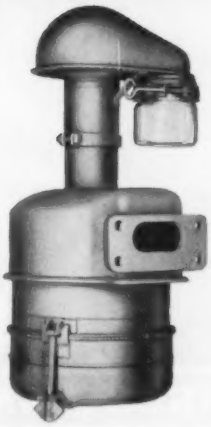
NAPA Assurance of Quality

Your NAPA Jobber is a Good Man to Know!

Most of the world's power equipment is protected by...

Donaldson Air Cleaners





The U.S. and Canadian manufacturers represented by these famous trademarks produce most of the world's heavy-duty engines, trucks, tractors and power equipment.

These units are equipped to operate under every kind of unfavorable condition which might be encountered on the job . . . in this country and overseas.

To protect engines against one of the most dangerous of these variable conditions . . . AIRBORNE DUST . . . *to assure high-level performance longer* . . . these companies install Donaldson Air Cleaners as factory equipment.

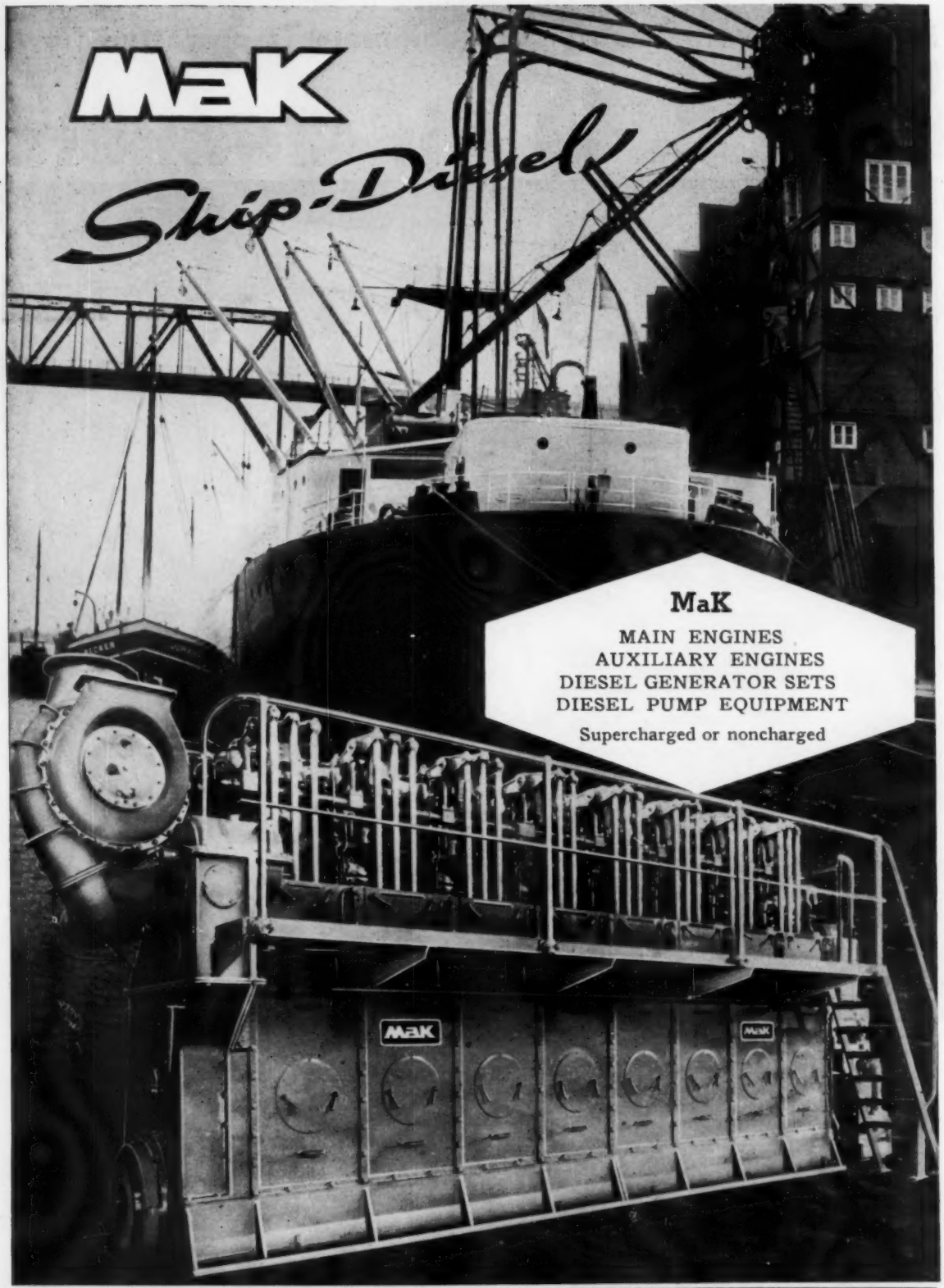
Many of them have used Donaldson Air Cleaners from the time dust was first recognized as a serious threat to the progress of power.

The performance of Donaldson Air Cleaners under all conditions, Donaldson research and engineering, and efficient Donaldson production . . . are all parts of the "Follow-Through" service package which has made Donaldson the world leader in heavy-duty air cleaners.

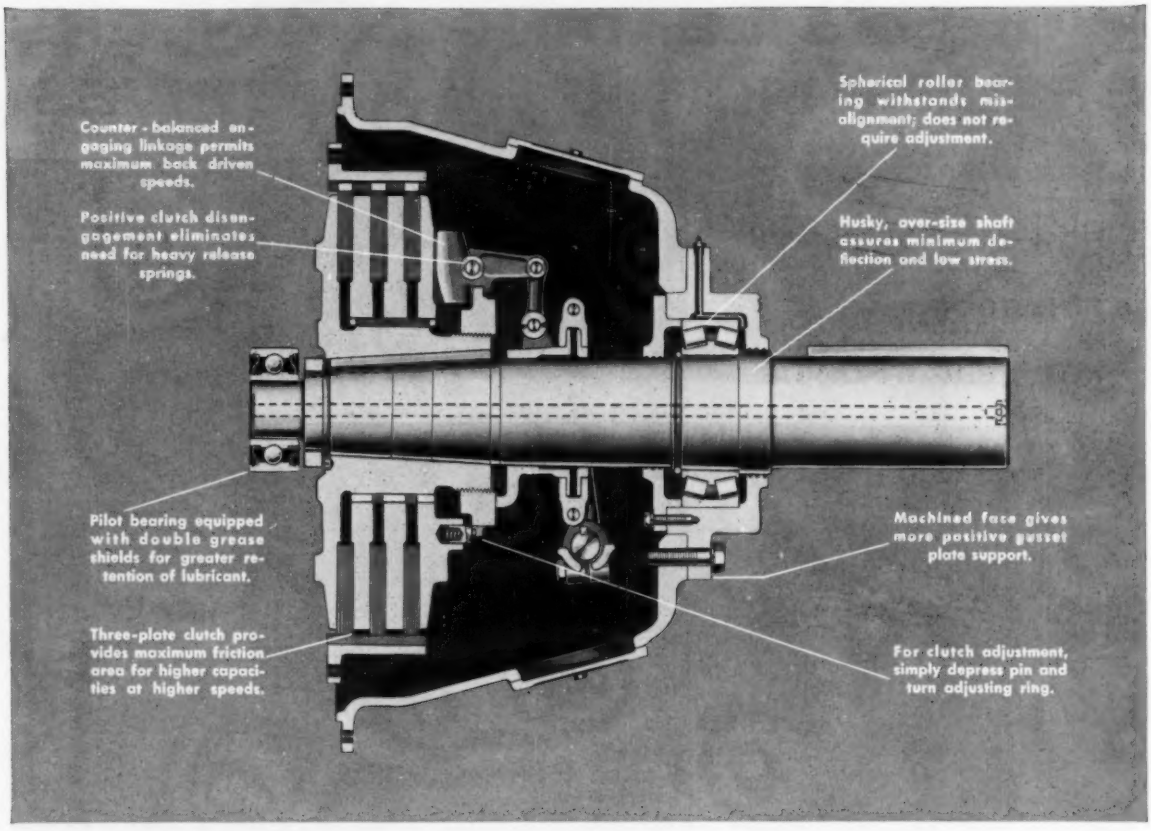
DONALDSON COMPANY, INC.

666 Pelham Boulevard — St. Paul 14, Minnesota

Grinnell, Iowa • Oelwein, Iowa • DONALDSON COMPANY (Canada) Ltd., Chatham, Ontario



MASCHINENBAU KIEL AKTIENGESELLSCHAFT
GERMANY


Counter-balanced engaging linkage permits maximum back driven speeds.
Positive clutch disengagement eliminates need for heavy release springs.
Spherical roller bearing withstands misalignment; does not require adjustment.
Husky, over-size shaft assures minimum deflection and low stress.
Pilot bearing equipped with double grease shields for greater retention of lubricant.
Three-plate clutch provides maximum friction area for higher capacities at higher speeds.
Machined face gives more positive gusset plate support.
For clutch adjustment, simply depress pin and turn adjusting ring.

A new Power Take-Off for higher-speed, higher-horsepower engines

Here is the all-new Twin Disc Model SP-318 heavy-duty Friction Power Take-Off—designed and engineered especially to meet the extra requirements of the new engines in the 350 to 375 hp range, operating up to 1800 rpm.

Extremely compact for its capacity, the new Twin Disc Power Take-Off is provided with an S.A.E. #0 flywheel housing. With triple driving plate construction, it assures ample friction surfaces to withstand high horsepower loads. And with solid driving plates, the new PTO effectively permits higher safe permissible speeds.

The pilot bearing of the new Power Take-Off is composed of a single row of balls, operating in bearing races of double-row width . . . providing improved accommodation of minor misalignment inherent in installations of this nature. Pilot bearings of this type provide additional space for lubricant, which is more effectively retained by the double grease shield construction. Although this construction is usually referred to as "sealed for life," the clutch shaft is drilled to provide for relubrication of the pilot bearing in the usual manner.

Another outstanding feature of the new Twin Disc Power Take-Off is the use of a spherical bearing which does not require adjustment. With its inherent ability to permit angularity, the spherical bearing is more resistant to overload and destructive forces resulting from heavy side loads.

For complete information on the new Twin Disc SP-318 Friction Power Take-Off (and the SP-314, a smaller model of the same new design, for engines in the 225 hp range operating at 2200 rpm), write to the Twin Disc Clutch Company, Racine, Wisconsin.

TWIN DISC

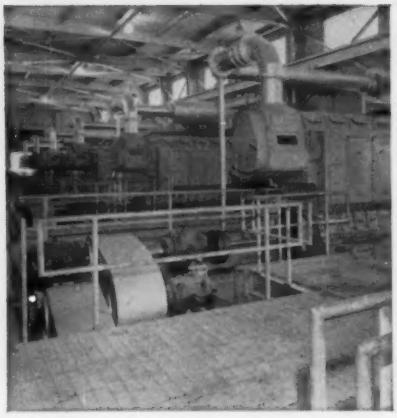
TWIN DISC

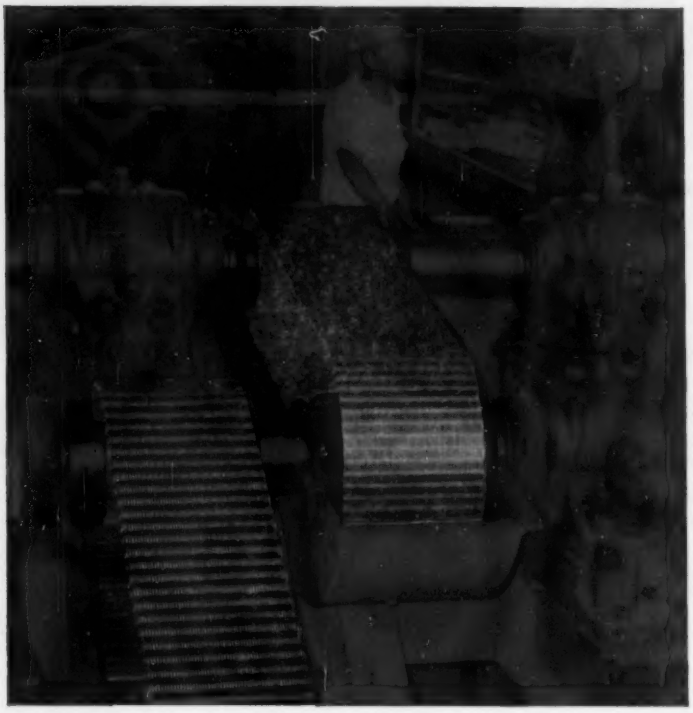
Friction Clutches and Fluid Drives

TWIN DISC CLUTCH COMPANY, Racine, Wisconsin
Hydraulic Division, Rockford, Illinois

WORLD'S LEADING ENGINEERS SPECIFY MORSE HY-VO DRIVES!

- **FOR EFFICIENCY**
- **FOR DEPENDABILITY**
- **FOR ECONOMY**
- **FOR PERFORMANCE**





Florida Flood Control Project: Dependable Morse HY-VO is on the job at the world's largest self-powered, low-lift pumping station. Designed to maintain a uniform water level in Lake Okeechobee, the project eliminates danger from floods and drought, permits the reclamation of 1100 square miles of potentially rich farm lands.

This pumping station houses six horizontal axial-flow propeller pumps, each with a capacity of 360,000 gallons per minute—a total capacity of 3.1 billion gallons per day! Each pump is driven by a 1600 hp opposed-piston diesel engine.

Morse HY-VO Drives were specified by the Army Corps of Engineers, as primary and secondary pump drives, for three reasons: (1) The field-proved performance of HY-VO assured round-the-clock dependability under severest operating conditions. (2) HY-VO permitted the use of lighter weight, lower cost engines. (3) Savings in required space for HY-VO Drives eliminated the need to increase the size of the buildings housing the pumping units.

This typical application of HY-VO is only one of a tremendous number where Morse HY-VO Drives are successfully used.

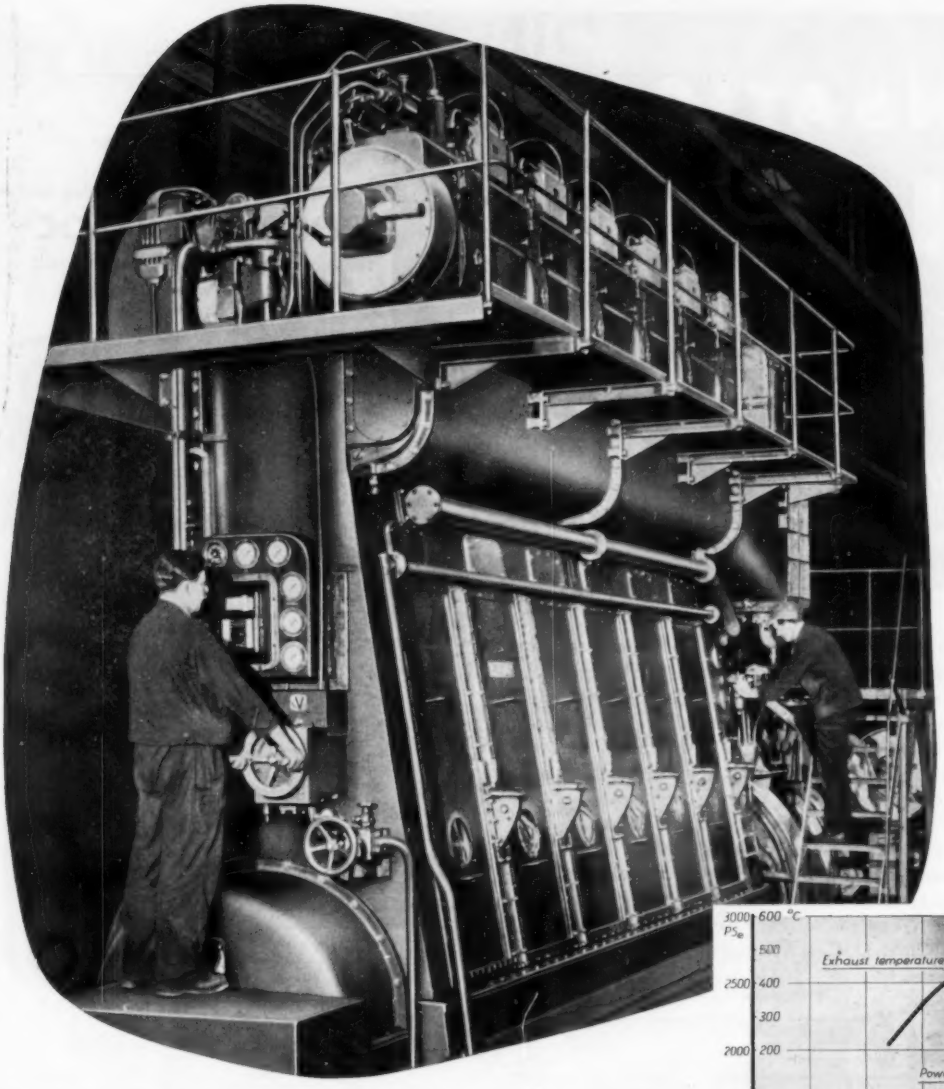
There are many reasons why Morse HY-VO is specified in applications demanding performance "extras": HY-VO's longer service life reduces per-hour operating cost; HY-VO is easy to assemble, install, and maintain on the job—keeps downtime *down*. Capable of transmitting up to 5000 hp in single-drive units, HY-VO runs at speeds up to 8500 fpm and makes possible the economies of using lighter weight, higher speed engines. HY-VO cuts vibration to a minimum, runs smoothly and coolly while transmitting power with less sprocket-tooth wear and more than 99% efficiency.

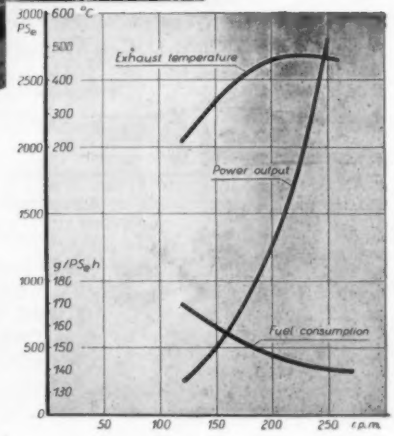
HY-VO is available from your local Morse Representative's stock. Wire, write, or phone him today, for complete HY-VO information. Put dependable Morse HY-VO to work cutting costs on your heavy-duty drive applications.

Find out, too, about the other quality products that your local Morse Representative stocks for your power transmission requirements: Morse Roller Chain, Silent Chain, Sprockets, Couplings, and Clutches. MORSE CHAIN COMPANY, INDUSTRIAL SALES DIVISION, ITHACA, NEW YORK.

MORSE

CHAINS, COUPLINGS, AND CLUTCHES





High Supercharging and Heavy Fuel Oil Operation

The KV engine type with high supercharging is built for highest economy. It has an extraordinarily low fuel consumption. The crosshead design renders this engine particularly suited for the combustion of heavy fuel oils. After long workshop tests this engine has proven its entire reliability as main marine engine in practical service.

M·A·N

MARINE DIESEL ENGINE

MASCHINENFABRIK AUGSBURG-NÜRNBERG AG. · WERK AUGSBURG

Represented in all countries

SENSATIONAL MILEAGE

STOPS! RING GROOVE WEAR

Double Bonded

METALLURGICALLY Al-Fin Bond

MECHANICALLY Zollner Lock

ZOLLNER

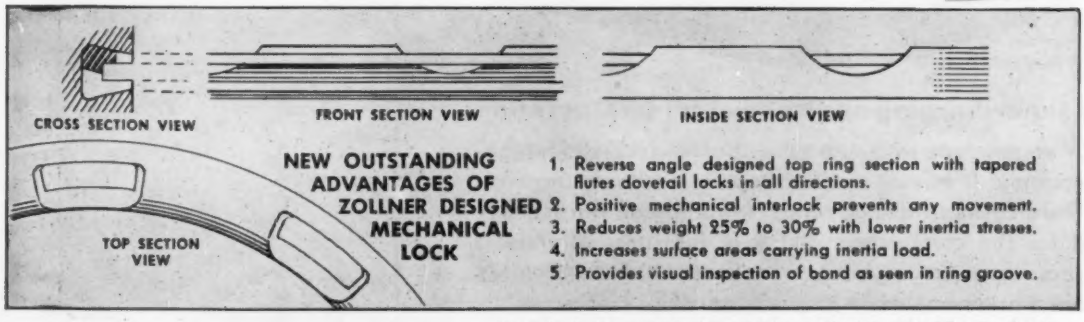
"Ni-Resist" Iron Top Ring Section

BOND LOC*

For Extra Heavy Duty Service

PISTONS

Up to 5 times more mileage is typical of this great new piston development by Zollner engineers. Designed for the most severe service, the BOND-O-LOC Piston has a "Ni-resist" iron top ring groove section *permanently* incorporated by *both* Al-Fin metallurgic bond and the exclusive Zollner mechanical lock. Separation failure is impossible. Reverse angles on every surface joining the "Ni-resist" iron section provide a multiple dovetail bond which is infinitely wedge-locked. Ring groove wear problems are eliminated, blow-by prevented, oil consumption reduced, mileage between overhauls greatly increased. Many heavy duty engine builders have already tested and approved BOND-O-LOC advantages. Request complete information, now.



NEW OUTSTANDING ADVANTAGES OF ZOLLNER DESIGNED MECHANICAL LOCK

1. Reverse angle designed top ring section with tapered flutes dovetail locks in all directions.
2. Positive mechanical interlock prevents any movement.
3. Reduces weight 25% to 30% with lower inertia stresses.
4. Increases surface areas carrying inertia load.
5. Provides visual inspection of bond as seen in ring groove.

Licensed under Patents 2,396,730; 2,455,457; 2,550,879 * T. M. Reg. Pat. App. For

- **ADVANCED ENGINEERING**
- **PRECISION PRODUCTION**

in cooperation with engine builders

ZOLLNER PISTONS

THE ORIGINAL EQUIPMENT PISTONS

ZOLLNER

ZOLLNER MACHINE WORKS • Fort Wayne, Indiana

TOCCO* and the Diesel Industry Progress Together

● In the manufacture of many Diesel engine and accessory Parts TOCCO Induction Heating has proved a sound method of increasing product quality, speeding production and lowering unit costs. TOCCO-hardening of vital parts prevents wear, insures 5 to 10 times longer life—with consequent customer satisfaction.

A Partial List of Manufacturers of Diesel Engines and Accessories Who Use TOCCO-Hardened Parts

American Locomotive Company
The Auto Car Co.
Baldwin-Lima-Hamilton Corp.
The Buda Company
Caterpillar Tractor Co.
Cleveland Diesel Engine Div., GMC
Continental Motors Corp.
The Cooper-Bessemer Corp.
Cummins Engine Co., Inc.
Detroit Diesel Engine Div., GMC
Electro-Motive Division, GMC
Hercules Motors Corp.
International Harvester Co.
The National Supply Co.
Waukesha Motor Co.
Eaton Manufacturing Company
Link-Belt Company
Worthington Pump and Machinery Corp.
Thompson Products Company

And These Are Some of the TOCCO-Hardened Parts They Use

Crankshafts
Camshafts
Axle Shafts
Piston Pins
Shifter Rods
Adjusting Screws
Cylinder Liners
Rocker Arms
Cam Followers
Valves
Rocker Arm Shafts
Timing Gears
Shifter Forks
Transmission Gears
Final Drive Gears
Spiders
Universal Joint Assemblies

TOCCO Engineers can probably find applications in your plant, too, where TOCCO Induction Heating can improve product quality, increase production and lower costs. Such a survey costs you nothing and may save you a great deal.

THE OHIO CRANKSHAFT COMPANY

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NEW FREE BULLETIN

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Please send copy of "Typical Results of TOCCO Induction Hardening and Heat Treating"

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City_____ Zone____ State_____

Young Heat Transfer News

YOUNG RADIATOR COMPANY, RACINE, WIS.

Cool, Ventilate and Heat Iowa Power Plant with Young Mono-Weld Radiators

Like a chameleon, Radiators are ready for just about any climate or condition you can imagine. They'll keep stationary or mobile engines cool in the Belgian Congo . . . or do a whale of a job at Little America.

Take a look at all the tools Radiators use to do a real cooling job . . . baffles, by-passes, thermostats, pressure caps, coolants. Then, there are fans, pumps, and proven core designs . . . and engineering experience.

Radiator cooling eliminates needless troubles. It does away with engine hot spots, excessive oil consumption, carbon deposits, burned valves and valve seats, stuck pistons and other engine failures experienced with other types of cooling systems.

Don't be fooled by the claims of other types of engine cooling systems. Remember, only Radiators can provide efficient engine cooling under every type of climate or condition.

WRITE FOR FREE YOUNG RADIATOR COMPANY MONO-WELD RADIATOR CATALOG

Mono-Weld Jacket Water Cooler features are completely illustrated and fully described. Capacity and accessory information is given for various models in the Young Radiator Company line. Address your request for Catalog No. 1651 to, Young Radiator Company, Dept. 415-G Racine, Wisconsin.

Young Jacket Water Coolers Utilize Waste Engine Heat

Sioux Center, Iowa, Municipal Power Plant has taken full advantage of two Young Radiator Company Jacket Water Coolers used to dissipate engine heat in a recently added Nordberg supercharged, 1060 hp., Diesel engine.

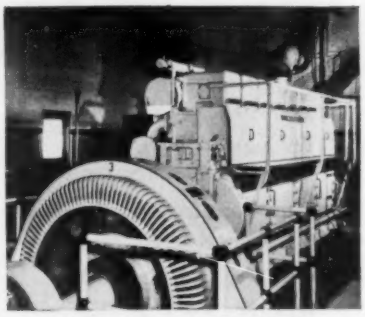
Young Jacket Water Coolers have been invaluable not only for rejecting engine heat up to 1,530,000 B.T.U. per hour, but also for utilizing this heat to reduce plant heating costs.

Located in the southwest corner of the building, which is equipped with louvres on the south, west and north walls, the Young Jacket Water Cooler shutters can be controlled to draw air through either one or both Coolers. Doors between engine and Cooler rooms may be opened or closed to draw either hot air out the engine room in summer for ventilation, or deliver hot air to the engine room during the winter heating months. A thermostatically controlled by-pass valve in the jacket water circuit of the engine maintains constant water temperature to the engine.

Young Radiator Company Jacket Water Coolers of rugged, *Mono-Weld* welded steel construction are available with water cooling capacities ranging from 500,000 to 2,300,000 B.T.U. per hour.

Accessories available for these Young Coolers include: fan motor; drive belts; sheaves; pump; oil-cooling coils; gas-cooling coils; manual or automatic (air, vacuum or electric) shutter controls; front core guard screen when shutters are not required; warm-up curtain used with screen; and surge tank.

View of Young Radiator Company Mono-Weld Radiator



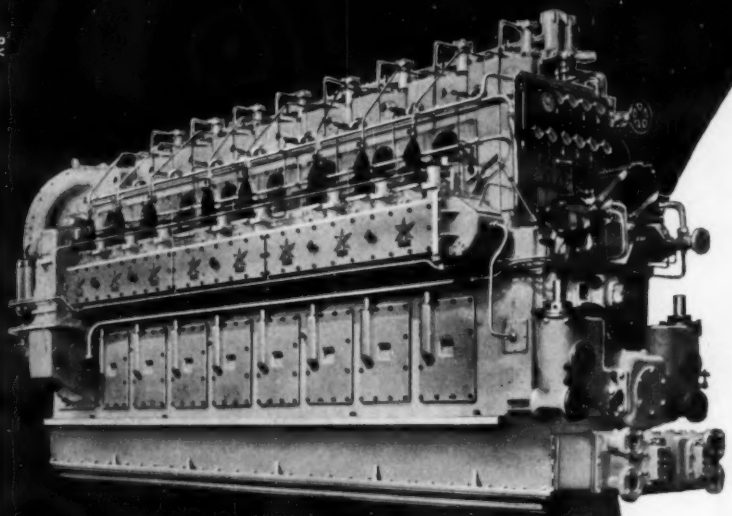
Nordberg Diesel engine cooled by Young Radiator

For additional details write for free Young Radiator Company catalog offered in column at left.

Mono-Weld is a Young Radiator Company Trademark

Young RADIATOR COMPANY
RACINE, WISCONSIN
Creative HEAT TRANSFER ENGINEERS FOR INDUSTRY
Heat Transfer Products for Automotive, Aviation and Industrial Applications.
Heating, Cooling, Air Conditioning Products for Home and Industry.
Executive Office: Racine, Wisconsin, Plants at Racine, Wisconsin, Mattoon, Illinois

HENSCHEL



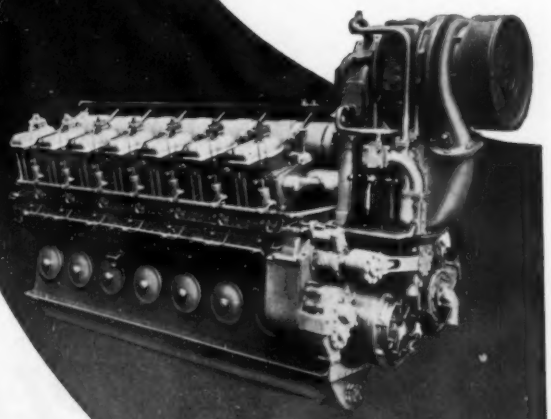
DIESEL ENGINES

for ship propulsion
stationary installations
rail traction

The range of our manufacturing program comprises two- and four-stroke engines for all purposes from 150-6000 BHP. Our two - stroke - types meet all requirements for simple construction and handy operation.

Two four-stroke-types are built under license SEMT - Pielstick as in - line and V-engines.

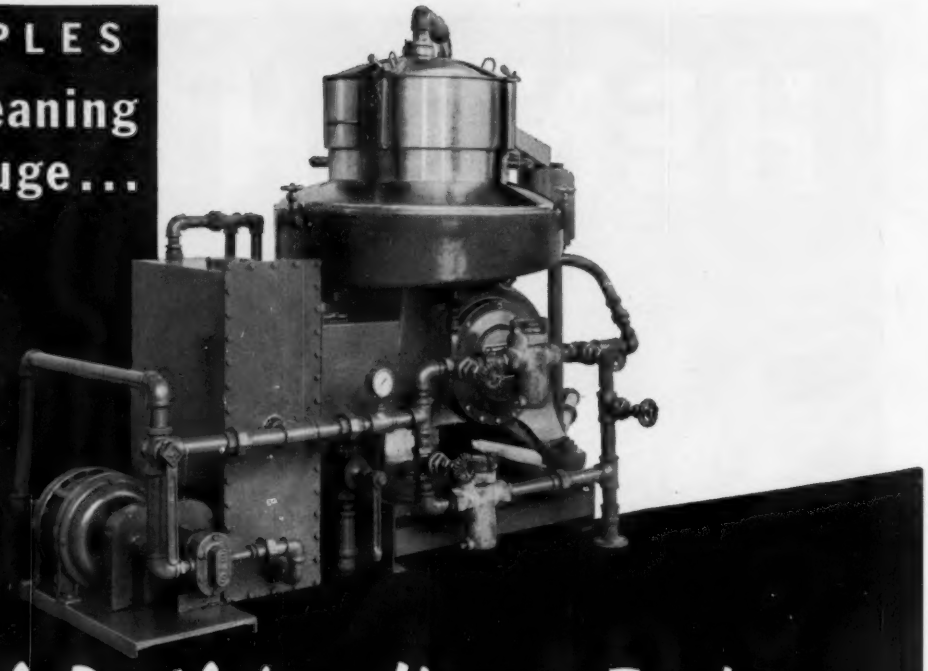
Output of all four - stroke engines may be increased by exhaust - supercharging. Typical features of our engines are economic fuel consumption and low costs for maintenance. They represent a modern construction and correspond to the highest standards of modern Diesel engineering.



HENSCHEL MASCHINENBAU GMBH HAMBURG

SHARPLES

Self-Cleaning Centrifuge...



Takes the Work Out of Purifying Heavy Fuels—

Sharples has licked the bowl cleaning headache in the purification of residual oils for use as diesel engine fuel.

Now, with the Sharples Re-cycle Centrifuge System shown above, the unburnables are continuously removed regardless of the amount of dirt in the oil—at high capacity. In plant operation, this centrifuge has proved its ability to handle large quantities of dirty oil over long periods of time without the necessity of bowl cleaning—thus practically eliminating this time consuming operation.

The Sharples Re-cycle Centrifuge System can also continuously remove entrained water as well as dirt from heavy fuel.

Sharples research in heavy fuel purification has now removed one of the large obstacles which we believe deterred many diesel engine operators from taking advantage of the great savings from using residual oils.

THE SHARPLES RE-CYCLE CENTRIFUGE SYSTEM WILL PAY FOR ITSELF IN A FEW MONTHS. SPECIFY SHARPLES ON YOUR NEW DIESEL—INSTALL A SHARPLES FOR YOUR PRESENT ENGINES. WRITE OR PHONE FOR THE FACTS TODAY.

SHARPLES

THE SHARPLES CORPORATION

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MORE SPEED • GREATER ACCURACY

with Kwik-Way CYLINDER BORING MACHINES on the job

KWIK-WAY Cylinder Boring Machines are simple in set up and operation. They're precision engineered for maximum accuracy—real time-savers on all types of boring jobs.

Call in your KWIK-WAY man for a demonstration . . .
See these superior features in action:

- **Overhead chip removal**
- **Screw feed with automatic retraction**
- **Two speeds—instantly changeable**
- **Three finger centering**
- **Quick, positive, non-distorting anchoring**
- **Rigid construction—no additional supporting devices necessary**
- **Bores close to dash**
- **V-belt spindle drive eliminates evidence of gear chatter on finished cylinder wall**
- **Pre-loaded spindle bearings**
- **Quick, easy, accurate tool setting eliminates "sense-of-feel"**

Model "FT"
Capacity
2.630" to 5 9/32",
12½" stroke

Model "FR"
Capacity
2.2" to 4 7/16",
12½" stroke

KWIK-WAY precision equipment is sold only through factory trained representatives. Mail the coupon below for appointment or complete information.

Kwik-Way

SERVING THE MOTOR REBUILDING INDUSTRY SINCE 1920

VALVE FACING MACHINES • VALVE SEAT GRINDERS • VALVE SEAT INSERT TOOLS CYLINDER BORING MACHINES • VORTEX SUCTION DEVICE • LINE BORING MACHINES • PISTON CAM TURNING AND GRINDING MACHINES.

Cedar Rapids Engineering Co.,
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☐ Please send complete details on Kwik-Way Cylinder Boring Machines
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☐ _____
Other Equipment in which interested

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Company _____
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City _____ State _____

JOSEPH P. SPANG JR. *Portrait by Fabian Bachrach*

"A majority of the employees at Gillette..."

"The United States Savings Bonds program is good for the personal security of the bond buyer—good for the security and economy of the Country. A majority of the employees at Gillette Safety Razor Company purchase Savings Bonds the payroll savings way. Under this plan they find it easy to save a tidy sum for retirement years, to pay that unexpected bill, or meet the expense of other emergencies that arise."

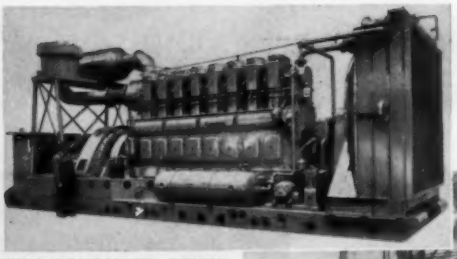
JOSEPH P. SPANG JR., ***President***
The Gillette Company

If less than 50% of your employees are enrolled in the Payroll Savings Plan . . . if you have not conducted a person-to-person canvass in the past two years *(or if you do not have the Plan)*, act now! Telephone, wire or write to Savings Bonds Division, U. S. Treasury Department, Washington, D. C. You will hear promptly from your State Director, who will be glad to help you conduct a person-to-person canvass that will put an application blank in the hands of every employee. That is all you have to do. Your employees will do the rest. They want to save for their personal security.

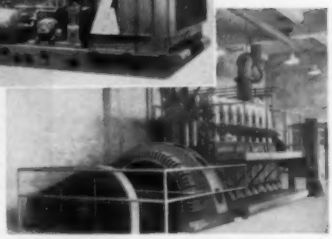
The United States Government does not pay for this advertising. The Treasury Department thanks, for their patriotic donation, the Advertising Council and

DIESEL POWER

LOW COST MUNICIPAL POWER. Three Enterprise DSG-38 Turbocharged Diesel Generator Sets resulted in $38,000 annual profit for the City of McLeansboro, Ill. Electric rates were cut, plant is quickly paying for itself.

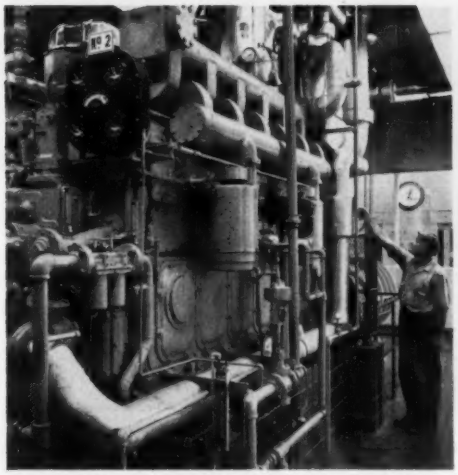


SELF-CONTAINED TRANSPORTABLE POWER, fully equipped for immediate field operation, gets big jobs done faster, for less. This Enterprise unit is specially designed for use in remote areas.



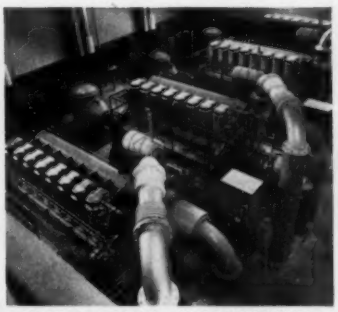
AUTOMATIC STANDBY ELECTRIC POWER. There will be no blackouts at San Francisco's new $50,000,000 International Airport with this 1000 KW Enterprise fully automatic standby unit.

The Switch is to ENTERPRISE —the pay-off is in more efficient, lower-cost power

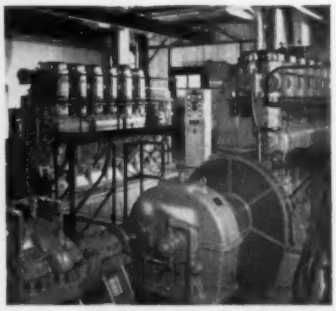


BIG SAVINGS IN SEWAGE DISPOSAL. Six Enterprise Spark Ignited Gas Engines, burning sewage sludge gas, replaced purchased power for pumping 40 million gallons of sewage daily through San Diego plant.

BASIC ENGINE DATA				
ENGINE MODEL	BORE & STROKE	NUMBER OF CYLINDERS	HP	RPM
M	8 x 10	3, 4, 6 & 8	73-1015	450-1000
G	12 x 15	6 & 8	273-2313	250-600
Q	16 x 20	6 & 8	647-2924	250-375
R	17 x 21	6 & 8	767-3467	250-375
RV	17 x 21	12 & 16	1228-6933	200-400



INSTANT ACTION WATER PUMPING. Oakland, California licked a storm flood problem by installing four 1200 HP Enterprise Engines. They drive huge mixed-flow pumps, are fully automatic.



PEAK EFFICIENCY FOR PIPELINE PUMPING. Union Oil Company's Ventura Station, powered by two Enterprise 465 HP Engines, is capable of handling fluctuating loads regardless of viscosity changes.

Our product is power—low cost, dependable power designed and proved for the tough, demanding municipal and industrial jobs.

Here are some of the things that officials, owners, operators and superintendents say about their Enterprise power:

"Our Enterprise has averaged 14,000 BHP hours per gallon of lube oil!"

"After switching to Enterprise, estimated savings in fuel alone will amount to $12,000 per year."

"Our operating costs were cut $3,000 per month when we switched to Enterprise Dual-Fuel operation."

"Our Enterprise units were a deciding factor in bringing new industry to settle here."

When you talk to the satisfied Enterprise customers in your area, you'll see why your next engine should be an Enterprise, too. Then call your nearest Enterprise sales office, or write us direct for prompt information and recommendations on your problem.

Over a million horsepower at work the world over!

ENTERPRISE *dependable* **ENGINES**

ENTERPRISE ENGINE & MACHINERY CO.
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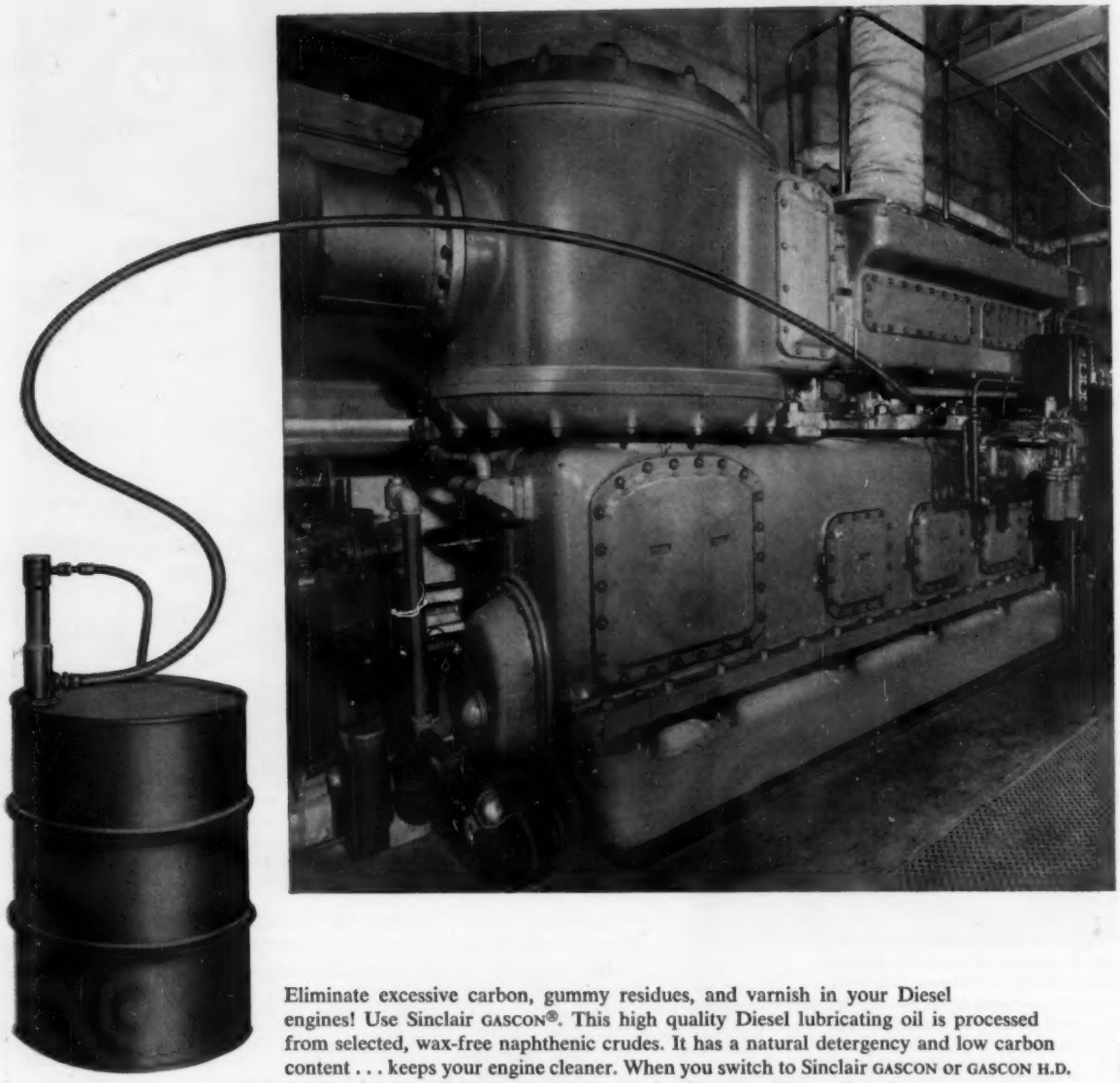
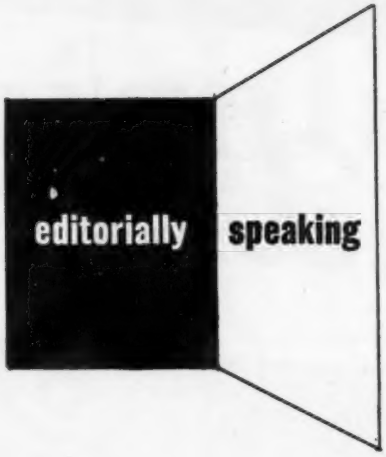
Check Carbon!



Eliminate excessive carbon, gummy residues, and varnish in your Diesel engines! Use Sinclair GASCON®. This high quality Diesel lubricating oil is processed from selected, wax-free naphthenic crudes. It has a natural detergency and low carbon content . . . keeps your engine cleaner. When you switch to Sinclair GASCON or GASCON H.D. you know that pistons, rings, valves and exhaust ports stay free from carbon, gums and varnish.

No matter what design of engine you're operating, you'll be 'way ahead with Sinclair's complete line of Diesel lubricants. Contact your local Sinclair Representative now for full details, or write Sinclair Refining Company, Technical Service Division, 600 Fifth Avenue, New York 20, N.Y.

SINCLAIR GASCON OILS



Operators Get a Break

You might call it "coddling"—this trend toward designing for the operator's comfort and convenience, we mean. And they have less to do. Time was when the tractor-trailer jockey had to wheel his behemoth through traffic, watching lights, people and cars, while expertly double-clutching and shifting gears up and down. Bus drivers did the same, plus making change and convincing riders there was more room in the back. Now, they're getting to be a shiftless bunch — automatic transmissions do the shifting, we mean — leaving them to do what was intended — drive. They are up where they can see, with visual obstructions minimized. Their seats recognize that no men are created equal — in size, that is — and plus being adjustable, are even comfortable! This philosophy extends to earthmoving equipment, too. Visibility, comfort and convenience were never better. No need to muscle steering clutches — they have boosters; leg power is cut with easier-actuated brakes. Some rigs even steer with push buttons or pilot control. Talk of refinements, some fast scrapers even have a safety bar to hold so that you won't get thrown out on rough haul roads! Then look what they did on the railroads. They threw the fireman's coal scoop away and took the cinders out of the engineer's eyes. Looking at shops, they made great concessions to the sacroiliac. There's lifting gear around, for one thing. The fraternity paddle-line posture so popular when engines were repaired on low skids has gone under the impact of engine stands. They turn the engine so that you can work on top or bottom as an upright man — standing upright, we mean. Anyone nostalgic for the days of doing it the hard way has a hole in his head. Some might point to these long overdue improvements as a great humanitarian movement. Could be, but it is also a fact that it is common sense and good business. Jobs get done easier, faster and better — hence cheaper. Let's see if we can't "coddle" some more.

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highlights

■ An all-out war has begun on industry's No. 1 enemy, corrosion, which rolls up a $5 billion annual loss through failure and fatigue of metals. A $200,000 corrosion research council has been formed by the Engineering Foundation, 29 W. 39 St., New York. Industrial leaders are being sought to join in the fight.

■ Mount your machinery to save on taxes, advises Barry Controls, Inc., makers of machinery mountings. Reason—real estate taxes apply in many areas if machinery is bolted to the floor. If mounted, personal property taxes providing for quick depreciation, apply.

■ A process for producing coke fine enough to be fluidized has been developed by Henry J. Kaiser Co. Normal operations were not interrupted when the fluid coke was recently injected into the fuel system at Permanente Cement Co.

■ ARBA has thrown its full weight behind support of a well-balanced national highway program. From the standpoint of national economy and defense, it recommends priority for completion of the 40,000 interstate system and more aid for intrastate roads.

■ Modifications of the diesel engine principle have gone into a pile driving machine designed by Syntron Co. Its hammer burns diesel fuel in the cylinder to drive the piston against an anvil head, which in turn transfers the impact energy to the piling. Piling is "pushed" rather than driven as with drop hammers.

■ A brand new railroad is being built by Walt Disney in Anaheim, Cal. Called the Santa Fe and Disney Railroad, it will operate two ¾-normal size trains, a passenger and a freight, to carry visitors to Disneyland. Reminiscent of the old days, they will be steam-powered and run over about 9000 ft of trackage.

■ Missouri Pacific Lines has joined the 100% dieselized team. Since 1948, it has placed 688 diesel units in service, bringing the total number of diesels in its fleet to 873.

■ Magnaglo is being used by a big hardware store (wholesale and retail) to check all its hammers. A hammer is a pretty simple tool. It only emphasizes the shortsightedness of those who fail to use this and similar methods to inspect critical engine parts.

■ A $1000 prize is yours if you can come up with best name for a new air screwdriver featuring a muffler-type exhaust. Send your entry to Thor Power Tool Co., Aurora, Ill., by Aug. 31st.

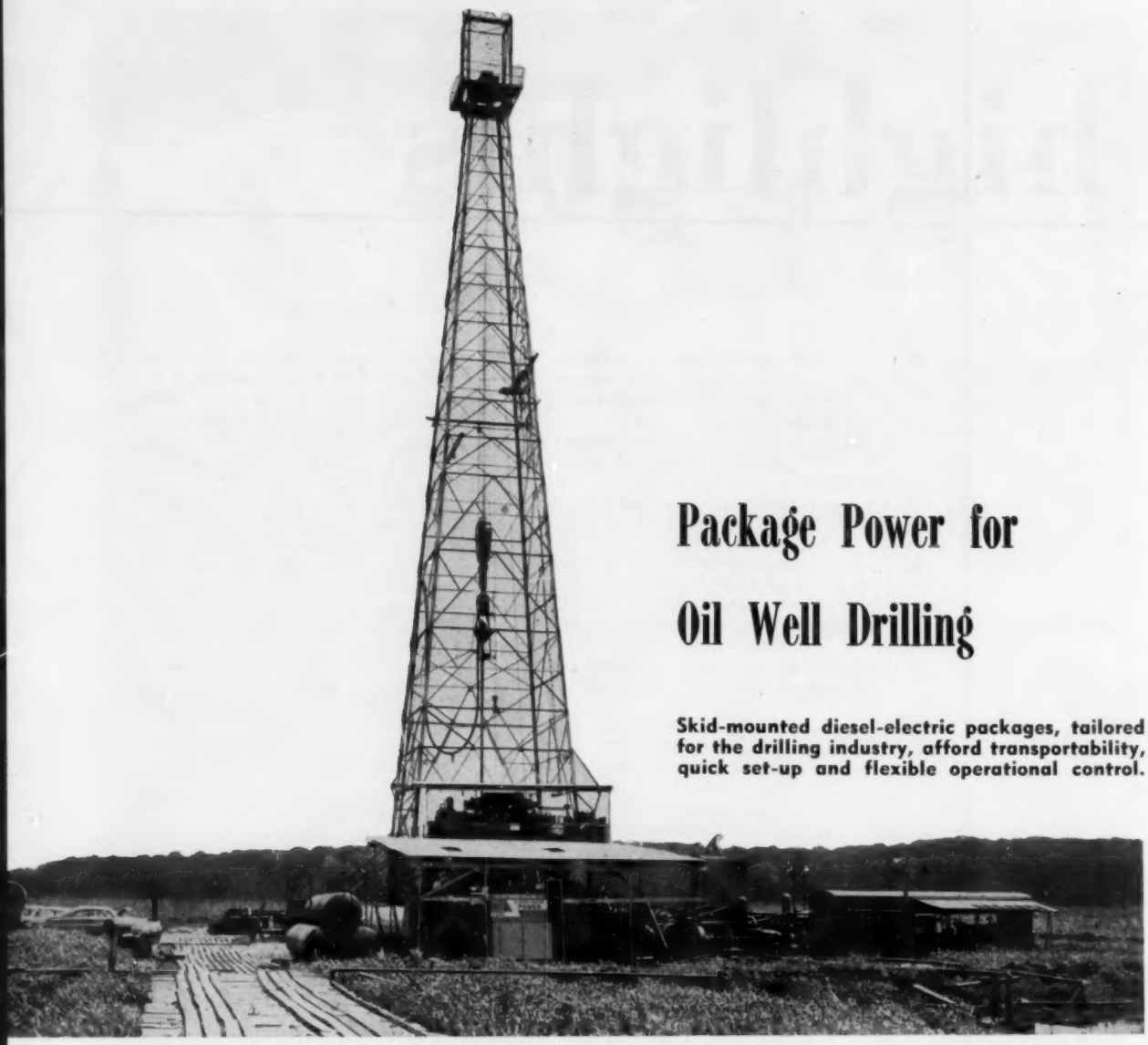
■ Who do you think are the second largest users of 2-qt ice cream containers in Texas? El Paso Natural Gas Co. is using them as junction boxes in its cathodic protection system. Electricians make the splice in the container, which is then filled with Anaconda Superseal No. 150. Reported result is an inexpensive, reliable junction.

■ Municipal passenger transit of the future may be provided by a robot, rubber-wheeled train guided by a single rail and operated on an overhead concrete road system. According to Henry K. Norton, NYC Transit Authority, it would be safe, run up to 70 mph, and be controlled by a station agent.

■ GE has announced delivery of the first American dual-powered passenger locomotive, equipped with electronic tubes to convert AC power to DC. It will operate on the New Haven. Now how about a diesel-electric that can shut down its engine and pick up electric power for its traction motors from available outside source? It would stop a lot of switching from diesel to electric locomotives (and vice versa), particularly in the New York area.

Package Power for Oil Well Drilling

Skid-mounted diesel-electric packages, tailored for the drilling industry, afford transportability, quick set-up and flexible operational control.



Offshore Company's drilling rig on location near Houma, Louisiana, where the first two "Electro-Motive Power" units were installed early in April.

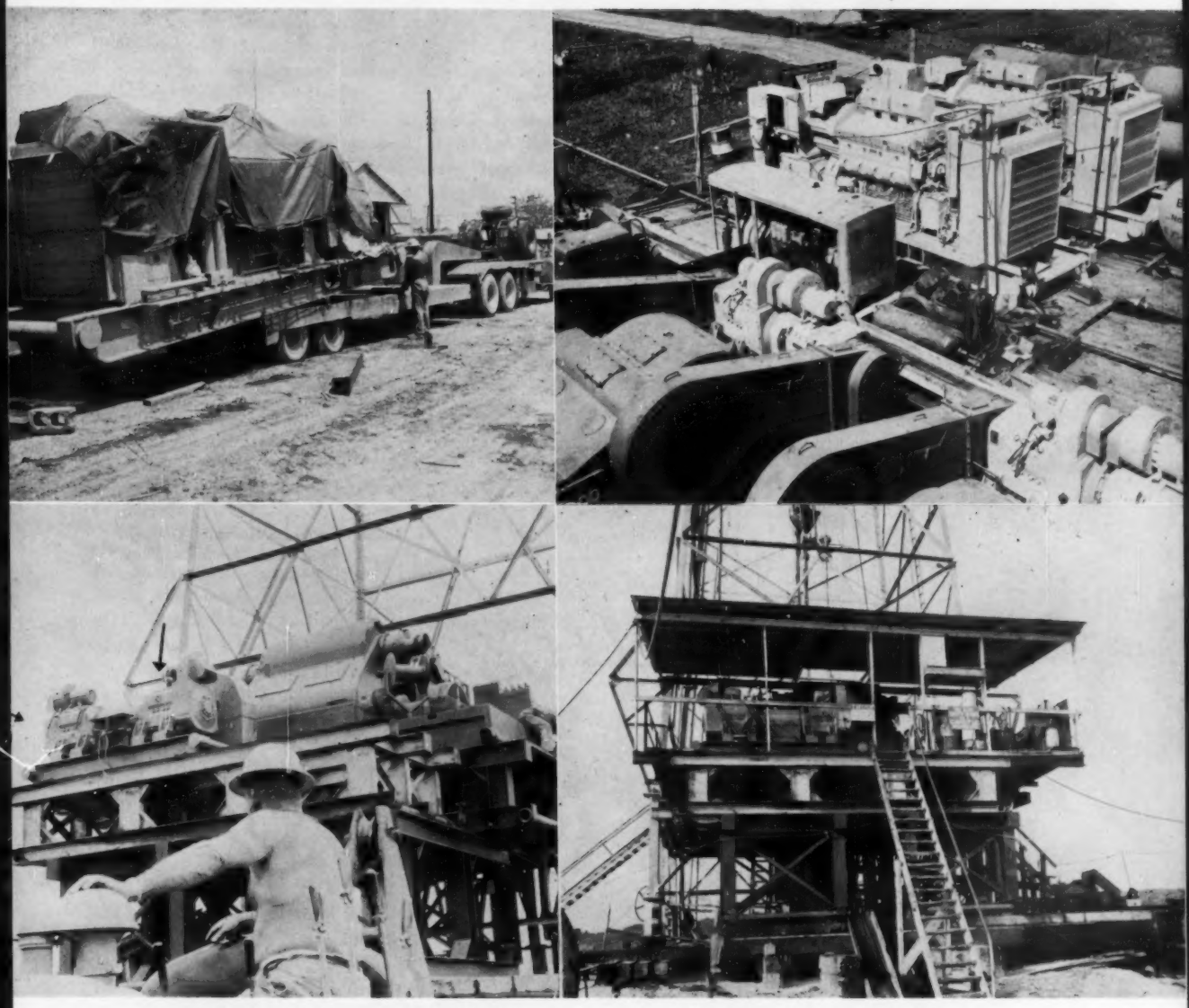
EXTENDING the development and concept of portable power packages, EMD has come up with one for the oil drilling industry. By integrating several components, some that many railroad men will recognize, they have put together a portable power package designed for the diesel-electric drive of oil well drilling rigs.

Basic units consist of 8- or 12-cyl GM Model 567C 2-cycle diesels—developing 875 and 1310 hp respectively. These are skid-mounted with two generators, generator control cabinet and engine cooling apparatus.

DC current from the generators is supplied to the 625-hp motors, which, singly or in pairs, supply power for the mud pumps, draw works and rotary table. Protective relays and control circuits are basic in EMD's control scheme.

Current is carried by heavy cable from the engine to a motor-control cabinet with two leads going from this cabinet to each motor. Cables are quickly connected and disconnected with no bolting or taping required.

With units of this type providing power, set-up time should be cut way down since there are no alignment problems. In off-shore operations, this advantage means that power units can be put into a minimum of space with important savings in high-cost barge deck area. Then too, power units can be placed on the barge so as to effect the best possible weight distribution.

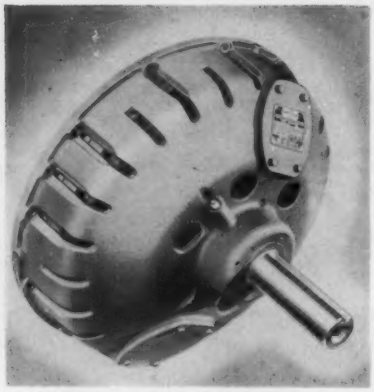


Transportability of the power units is demonstrated at the upper left. At lower left, rig is being set up. Arrows point to the 675-hp, series-wound motors which provide power for the draw works. At upper right, engines are in place. They will supply power to the mud pumps in the foreground and also the rotary table and draw works. Completed drilling platform is shown at lower right.

According to Mr. N. C. Dezendorf, vice president of General Motors Corporation and general manager of EMD, "all units delivered to the oil fields will be backed up by on-the-job engineering consultation and the educational facilities of EMD's Diesel Training Center at La Grange will be available to petroleum industry personnel for schooling in the proper operation and maintenance of this type of equipment."

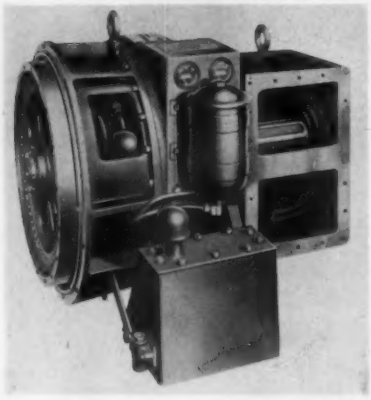
In addition to using Electro-Motive power for new drilling rigs, Mr. Dezendorf pointed out that the new diesel-electric units can be used in place of steam power on older rigs presently in use in the oil fields. He disclosed that two 8-cyl units were delivered recently to the Phillips Petroleum Company to furnish power for a former steam rig that Phillips is converting to diesel-electric for off-shore drilling.

The first units, consisting of two 8-cyl, 2-cycle GM Model 567C engines and associated equipment went to the Offshore Drilling Company and were put to work near Houma, Louisiana.



Fluid coupling incorporated in a hydraulic power take-off.

Coupling Or Converter?



Hydraulic torque converter arranged for power take-off.

by W. B. Gibson

Sales Manager, Hydraulic Division, Twin Disc Clutch Company.

Facts and factors to consider about fluid couplings and hydraulic torque converters as a guide for understanding their operation, their characteristics and their application.

"I NEED a 200-hp engine." With this expressed need and your checkbook you would have little difficulty in getting your engine. The big question is whether you would then have what you wanted. It would all depend on how closely the engine's characteristics—considering also the drive train—matched the operational requirements.

The drive train is a very important factor in application engineering. It is a fair analogy to think of it as a very versatile liaison agent between known operational conditions and the engine's characteristics. Properly selected, it can get the job done well with a minimum of waste and it reconciles differences between the two principals.

If the job to be done requires fairly constant speed and torque and power can be engaged against little or no load, a mechanical power take off could well be the best answer. But suppose that speed and torque varied widely, often moving in opposite directions. Or that you had to start against a substantial load. Or perhaps shock loading was involved. Then you have to do some figuring.

Today's application engineer would probably now tell you that you needed a fluid coupling or hydraulic torque converter. Their millions of operational hours under the most severe operational conditions are proving the soundness of this recommendation. Why?

Hydraulic Power Transmission

If diesels had a choice, they would like to run in the top third of their speed range and at fairly substantial and constant load. They would like to pick up their load smoothly and gradually when operating in their most efficient range. Also, they abhor shock loads and the torsional workout that they get from many types of loads. In return, they would operate more efficiently, produce a higher average of their power potential and last longer.

Hydraulic power transmission permits this to be realized to a very high degree. The ability of hydraulic drive to permit varying ratios of input to output shaft speeds as conditions alter gives a degree of independence to the engine and allows it to do its best. The fluid's ability to absorb shocks cushions and protects the engine.

Granting these advantages, is the fluid coupling or the torque converter the answer? Again it's a problem for the application engineer; each has its place. What is the criteria?

Comparison of Converter and Coupling Capabilities

Capability	Converter	Coupling
Power applied through fluid; no mechanical hookup	X	X
Absorbs shock loads	X	X
Absorbs torsional vibration	X	X
Engine cannot be stalled	X	X
Output torque always equals input torque		X
Torque multiplication possible	X	
Solves problem of inadequate torque at starting speeds	X	X
Permits smooth engine operation at optimum rpm	X	X
Increases effective speed range of engine	X	
Part throttle operation limited to heat rejection capacity		X
Part throttle operation through engine speed range	X	
Designed for maximum slip as useful for "hovering" of loads (cranes, hoists, etc.)	X	

Fluid Couplings

To understand fluid coupling operation it is necessary to know what makes them tick. A basic coupling consists of two elements — an impeller or pump and a runner or turbine.

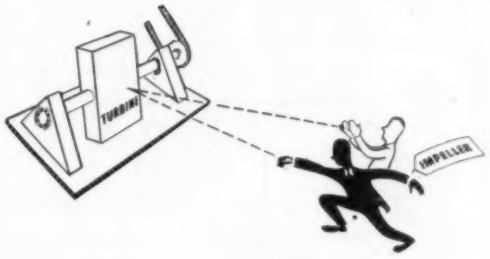
The engine's horsepower is absorbed in the impeller where it is converted to kinetic energy as a greatly accelerated outward flow of the coupling fluid. As fluid flows across to the runner, the runner's load resistance decelerates the flow which now is inward. Kinetic energy is released, imparting rotary motion to the runner.

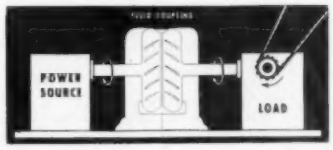
Thus, drive is obtained by absorbtion and release of kinetic energy in a fluid flow. This principle is common to both couplings and converters. The engine's input torque is transmitted to the driven equipment through the flow of fluid passing from impeller to runner. The rate of "flow" is determined by the input energy and the relative speed of the impeller and runner.

The effect of input energy is self-evident. The effect of the relative speed of the elements may be harder to visualize. A broad analogy is illustrated. Assume a paddle shafted on frictionless bearings. A pitcher throws a good-bouncing ball with sufficient energy to impart a 100-lb ft torque to the paddle. It returns to be caught and re-thrown. A steady stream of balls would turn the paddle, providing the torque load did not exceed the input torque.

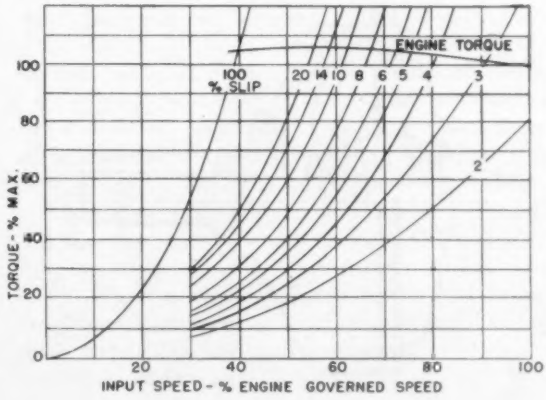
Maximum reaction and speed of return would occur when the paddle was stationary. As the paddle speeded up, rebound velocity would be lower and the cycle slowed up. When paddle rpm increased to where the point of impact was traveling at the ball's speed, there would be no rebound or circulation of the ball. Also, no torque would be transmitted.

These are the two extremes within which the coupling operates. Typical performance characteristics of a coupling are shown. The relationship of output torque





Analogy of fluid coupling torque transmission with relationship of power system elements blocked out. Below are typical performance curves for an engine-coupling drive. Output torque as a function of input speed at various slip percentages are shown.

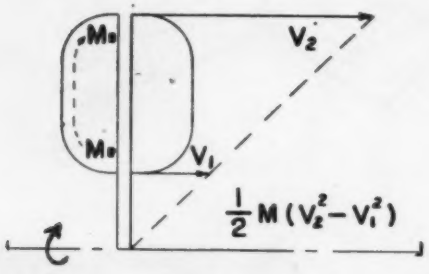


to input speed (% of governed rpm) is shown for varying percentages of slip. The 100% slip curve is the "drag" or maximum torque capacity at the speed percentages indicated. It occurs with the runner stationary.

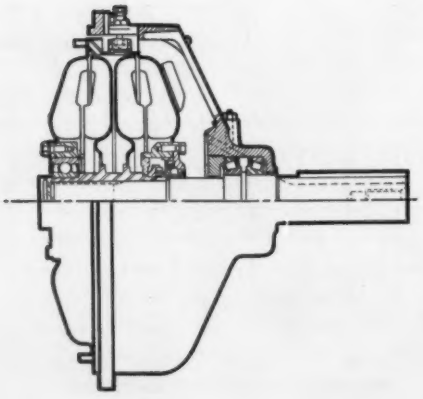
Twin Disc's Twin-Circuit Coupling

Despite many possible arrangements of coupling elements, the principles remain the same. Designs are altered to meet operational requirements or special conditions. For example, the drag torque curve of a coupling might be so steep as to actually "lug" the engine—the condition that we want to avoid. By altering the shape of the torus, changing the number of blades or restricting the fluid flow path, the drag torque curve can be modified to best suit the engine's torque curve.

This would indicate that some "tailoring" or at least careful selection of the coupling-engine combination is needed for best results. One major consideration is the unit's torque capacity. The power absorbtion capacity of both couplings and converters follow the basic laws for centrifugal pumps. Power absorbtion of the impeller will relate to the cube of its speed and the fifth power of its diameter. Torque absorbtion will relate to the square of its speed and the fifth power of its diameter. The effect of diameter is apparent.



Basic hydro-kinetic principle. Engine power is transformed to kinetic energy through increased fluid velocity with absorbtion capacity a function of circuit diameter. To increase capacity without diameter increase, twin-circuit coupling with modified torus design (as below) is used.



Specifically, the coupling's torque capacity will be a function of the inner radius where fluid is received and the mean radius at which it is discharged. This represents the fluid circuit diameter which will be reflected in overall coupling diameter. This suggests that the best way to increase torque capacity is to increase the fluid coupling diameter. This is one way: Twin Disc chose another.

Since large coupling diameter generally imposes a space and weight problem, they increased the torque capacity of their units by placing two couplings back-to-back as a single unit. This creates two separate circuits with double the weight of oil flowing at any given set of conditions. Torque transmission is essentially doubled and axial thrust of the elements is neutralized.

As a further space-saving feature, the fluid circuits are flattened and in the larger sizes inclined toward each other. The torus has also been modified to increase the inner-to-outer radius distance, and by restricting the total flow area, the drag torque is satisfactorily reduced. In this way a maximum of torque capacity is obtained with space and weight at a minimum.

Twin Disc builds hydraulic couplings with fluid circuit diameters ranging from 6.2 to 27-in. Those up to 10.6-in fluid circuit diameter are made of cast aluminum; for the 12.2-in to 27-in size, they are built of steel stampings. All of these units have straight, radial blading that permits operation in either direction. Also, either side of the coupling may be hooked up to the engine's shaft.

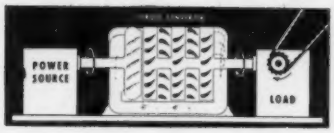
Couplings alone or in conjunction with gearing, with various types of output attachment, give wide flexibility of application. One unit in 21 and 27-in sizes has a fluid dumping arrangement that permits complete disconnection of the engine and load. No fluid, no power transmission.

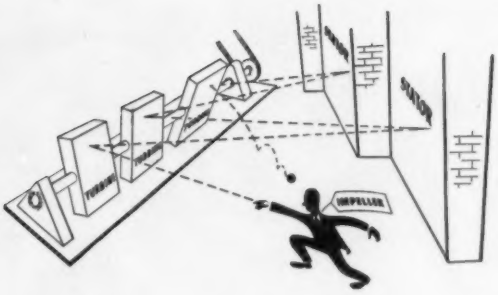
Hydraulic Torque Converters

We have seen how couplings transmit torque hydraulically. However, input torque always equaled output torque. Torque converters, as the name implies, multiply torque. Hydro-kinetic principles apply to both coupling and converter. It's just that something has been added.

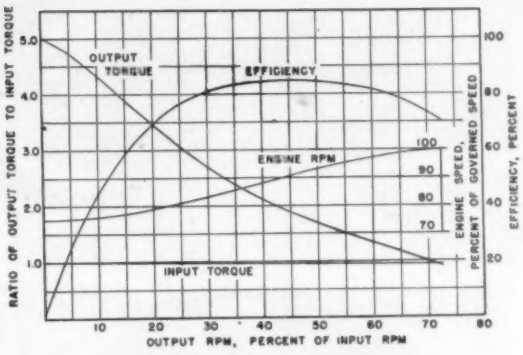
The single-stage converter has one stationary or reaction member added to the fluid circuit to direct correctly the flow of fluid from the discharge side of the turbine to the entry side of the pump and to form a fulcrum point upon which the fluid can exert a greater leverage to create a greater torque at reduced speed. Reaction torque is actually added to the input torque.

Blade shapes and the angle at which they are set within each of the members determines the relative value of reaction torque that will be added to the input torque under various operating conditions. Maximum reaction





Three-stage converter with elements arranged along shaft in steam turbine fashion to help visualization of action. The ball-and-paddle analogy is also helpful. A typical performance chart for an engine-converter combination is shown.



torque is provided when the turbine is completely stalled. It decreases as turbine speed increases, thus always and automatically making available the exact required torque for any change of load conditions. Modern converters, depending on design will deliver from 2 to 6.5 times prime mover torque with the output shaft stalled.

The 3-element converter described is termed a "single-stage" unit. By adding a second turbine stage after the reaction member it becomes a 2-stage unit. Adding a second reaction member and still another turbine stage, a 3-stage unit is formed. The additional elements alter the performance curves and have a particular advantage in that they permit very high torque multiplication ratios. A typical performance chart is shown.

To get a visualization of 3-stage functioning, the illustration shows the stages strung along the shaft in a manner very similar to steam turbine practice. Full pump energy is directed to the first turbine stage where some energy is absorbed. The stator directs the flow to the second turbine stage where more energy is removed. This process is again repeated. In the converter's toroidal circuit, the energy left in the fluid after the final turbine stage adds to the input energy as the fluid is smoothly directed to the pump.

The "paddle" analogy also applies here, only now there are three paddles and two stators. Our pitcher again throws his ball, imparting 100-lb ft torque. The ball rebounds first from the paddle and then from the stator, hitting the second paddle and imparting 75-lb ft torque. This is repeated with the second stator and the third paddle with the result that an additional 50-lb ft torque is added. Thus, the 100-lb ft input torque is multiplied to 225-lb ft.

As in the coupling, rebound velocity (here, resulting in torque multiplication) is at a maximum when the turbine is stalled, and decreases as turbine speed approaches pump speed. The torque multiplication ratios will vary through this range and since turbine speed will vary in accordance with the torque load, automatic adjustment occurs. Torque will be multiplied in exact proportion to the demand.

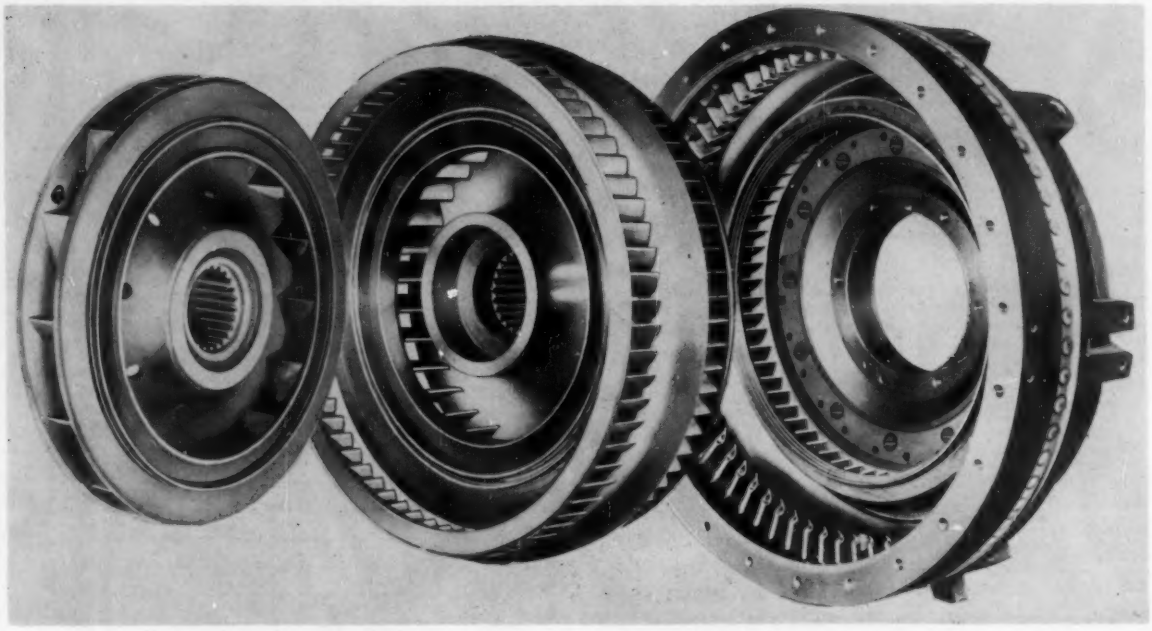
Twin Disc's 3-Stage Converters

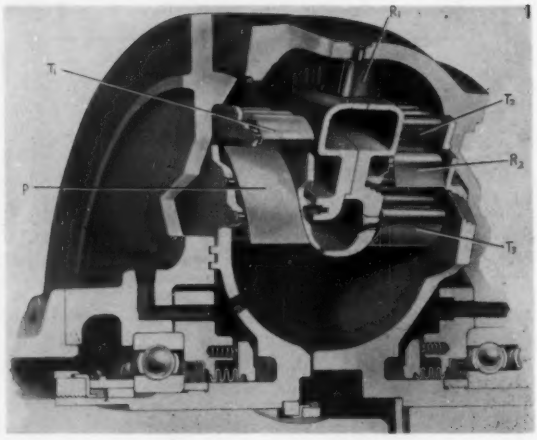
Automatic output torque adjustment is only one phase of widespread converter application. As with the coupling there is the matter of torque capacity and physical arrangements. This is why Twin Disc builds four models—the F, CF, IF and DF. Each model is available in four sizes or series (DF is built only in two) with seven horsepower capacities in each series. This range handles most horsepower requirements from 40 to 1000 hp.

Models F and IF are industrial-type units designed for continuous hydraulic converter drive with up to a 6 to 1 torque ratio. The model CF, incorporating a friction disconnect clutch between the engine and the converter, is an industrial type as well but is also used for trucks with minor revisions. The truck type features a "free-wheel" mounted between the impeller and turbine. When the accelerator is retarded the free-wheel automatically engages the impeller to the turbine, adding the latter's energy absorbtion to the engine's compression and friction for smooth powerful braking action. Recovery is automatic with load demand.

Model DF, a vehicle and locomotive-type, combines the free-wheel feature with two built-in oil-actuated clutches. The result is smooth hydraulic braking along with direct mechanical drive (for maximum fuel economy) where this feature applies. Fingertip controls give the operator four options—neutral, torque converter drive, direct drive, and converter braking.

Further applicational flexibility is afforded by a





Component of a 3-stage hydraulic torque converter are (r. to l.) the housing, turbine and pump. Assembly at left shows position of blading in fluid circuit: Pump blading — P; turbine blades — T_1, T_2, T_3; and stator or reaction blading — R_1, R_2. Fluid flow in the circuit as shown would be in clockwise direction.

variety of optional input and output ends, optional blading and a number of possible mounting arrangements.

Coupling or Converter?

Some basic data is now on record and we can understand some of the "tools" with which the application engineer would work. With a complete knowledge of the load and operational requirements he can consider both engine and drive together so as to come up with the most efficient "package".

A check list comparing couplings and converters operationally is shown. As a generalization, couplings are designed to overcome problems of high-inertia starting loads, to provide smooth starts, and to handle sudden, hard shock loads of brief duration. They are normally designed for 3 to 5% slip at full running load and speed.

Since output torque and input torque are always equal, the loss, due to certain rotational losses and skin friction within the coupling, appears as lower output shaft speed. Prolonged coupling operation at high slip will also show up as heat in the circulating fluid. The amount of heat developed and its dissipation are applicational factors to be figured.

By contrast, converters are designed for operation at varying torque loads and output shaft speeds. Due to the blading design, rotational losses are minimized. However, there is some loss and fluid coolers are commonly used.

This talk of losses brings up the economics of hydraulic drives. Their popularity answers the question. In some cases, fuel consumption may be slightly higher but in most cases the fact that engines operate for longer periods at the favorable end of their fuel curve offsets this. This is only part of the story.

Perhaps surprisingly, tests show fewer engine rpm's for a given job than when mechanical drives are used. Couple this with the protection from shock afforded the engine and elimination of harmful lugging and it adds up to real maintenance savings. Add to this the saving for less down time.

Frequently, smaller high-speed engines can be used with hydraulic drives. Here is a savings in first cost. And finally, the truest way to evaluate cost of operation is not to consider the cost per hour of operation but the cost in terms of the work done per hour. Here, by speeding up work cycles and utilizing a higher percentage of potential engine power the hydraulic drive, properly applied, is tops.

Cat's "Leadership in Action" Exposition

Leading parade with back hoe attachment and one rigged as a ditcher. Next are Traxcavators and tractor-drawn scraper. Next is side boom pipe layer and the larger tractors with various towed equipment. These are only a few of Cat's 96 products.

Caterpillar's accomplishments—past, present and with a peek at the future — were shown to their "family" in a dramatic exposition of earthmoving equipment.

MORE than 500 distributors, auxiliary equipment manufacturers and field representatives of the Caterpillar Tractor Company visited Peoria last month. They came from every state in the Union, every province in Canada and almost every free nation of the world. The occasion was an impressive array of equipment, both current production models and previews of those to come.

Believing in good communications, Caterpillar chose this method of getting across to its "family" what was being done at the factory. The exposition was keyed to the theme "Leadership in Action" and the company used every means including a movie, plant tours, talks, and proving ground demonstrations of their full line of products, to tell the story.

At the proving grounds, tractors, both track-laying and wheel type, motor graders, scrapers, wagons and Traxcavators went through their paces. A variety of attachments from dozer blade variations to rear-mounted shovel and back-hoe attachments were shown. The influence of changing demands from the field was everywhere apparent.

More horsepower to reduce cycle time and for greater work capacity was reflected in the big turbocharged D9 tractor recently introduced. This goes for wheel-type tractors too. Major design changes in the DW20 and DW21 tractors include a new turbocharged diesel rated 300 hp at 1800 rpm. Matching these two units are two new scrapers of Cat's "lowbowl" design. Wider and longer bowls have increased capacity to 18 yards struck and 25 yards heaped.

Pipe laying activity is reflected in a line of special pipelayers. A trend to deeper tillage on the farms shows up in more powerful tractors and special attachments for deep chiseling, subsoiling and plowing. Salvage logging appears as an array of machinery for barking, peeling and chipping slabs for pulpwood. These are only a few of the special needs reflected in current equipment.

At the factory, a part of Cat's post-war expansion program was seen. The diesel engine plant in Peoria is one of the largest and most modern in the world. After World War II, Cat had only the Peoria plant and one in San Leandro, Cal. Today they have nine, including their foreign subsidiaries in England, Brazil and Australia. Over $200 million will have been spent in the 10-yr postwar period.

Cat points out that this was not a sales convention; it was designed to expose those attending to the now 96 prime products, the people behind them, and the plans for the future. It was an "opportunity for the equity owners of dealerships the world over to inspect their franchise".

Engine No. 806 arriving at the St. Nicholas breaker with a heavy coal drag from the colliery at Gordon, Pa. Replacing two 1600-hp units during the week, No. 806 doubles in freight service over weekends when the colliery is shut down.

Report on Reading's Train Master Operation

Designed for versatility, Train Masters have solved several operational problems for the Reading plus lowering motive power investment and reducing maintenance costs.

SINCE introduction of the 2400-hp Train Master about two and one-half years ago, railroad men have been waiting to see whether a locomotive of this capacity could be utilized more intensively in everyday operation, than conventional units of lesser power. The Reading Company is principally a terminal railroad, hauling high tonnages over relatively short distances. Its experience should answer many questions in this connection.

The Reading lists as the four most important contributions toward economy made to date by the Train Masters:

1. Less initial capital investment needed to purchase nine 2400-hp locomotives as compared with cost of 13 or 14 smaller capacity units required to handle the same amount and variety of work.

2. Servicing and maintenance costs are less because of fewer units.

3. More efficient utilization of the road's entire pool of diesel units resulted from the addition of these nine higher-powered general-purpose locomotives.

4. Assignment of the Train Masters to specific duties in varied services, eliminated a considerable over-investment in motive power formerly existent in assignment of smaller units to these services, as later explained.

A survey of the Reading's use of the big units shows that, although designed to offer power equivalent to one and one half conventional 1500- or 1600-hp diesel units, this ratio is being exceeded. Train Masters are actually replacing smaller units at a ratio of 1 to 2.

This is being done at several locations in entirely different kinds of service. It usually occurs where power demands for particular jobs exceed the capacity of one 1600-hp unit, but where use of two such units results in an over-investment of motive power. The Train Master, with a normal weight of 375,000 lb plus 10,000 lb ballast, answers such power requirements. Its starting tractive effort at 25% adhesion is more than 50% greater than that of a conventional 1500- or 1600-hp, 4-driving-axle locomotive unit.

Tonnage ratings were set up for Train Master demonstrators when first delivered, by using the 1½:1 ratio, applying this to established ratings for 1500- or 1600-hp units. Then, 5% was added or subtracted depending on the grades of the particular run or other operating conditions to be encountered. This procedure is reported to have worked out well from the first day.

Wide Utilization

Reading's use of Train Masters includes a wide variety of work. Service performed ranges from regular assignments such as heavy yard shifting (train make-up), passenger service, and tough mine-drag duties, to special

week-end and other free assignments, mostly in various road freight services.

Variations in the auxiliary equipment of the different units facilitates this utilization. Seven units regularly assigned to yard and mine districts are equipped with dynamic brakes. They also have 4200-gal fuel tanks. Though not equipped with steam generators, two of these units have had steam train lines applied so that they can be used as a second unit behind any passenger unit equipped with a steam generator. The two remaining units are equipped for passenger service. They have dual controls, steam generators, 2400-gal water supply and 1800-gal fuel tanks.

Reading's TMs all are geared for 65 mph and powered by 12-cyl O-P engines, the basic power assemblies and transmission components of which are interchangeable with those of other F-M diesel units. (For a more complete description see DIESEL POWER, December, 1952, and December, 1953).

Engine No. 800, busy in east-end makeup yard at Rutherford, is first single unit powerful enough to handle job without helper.

Assignments

Regular assignments are at three key points, one on each of Reading's three divisions. Special assignments are made from one of these points, though mainly from the St. Clair, Pa. Terminal according to demands for power and availability of TMs from their regular duties.

Two units are regularly assigned to east-end train make-up at the Rutherford Yard, near Harrisburg, Pa. Working separately, each TM maneuvers about the east end of eastward classification yard, picking up cuts of cars from the various classification tracks until 60 or 70 cars are assembled. This drag, which is to compose the rear end of the train being built, is pushed up a 1% grade into a make-up track at one side of yard. Then another drag of about the same size is assembled from the classification tracks to form the head end of train and is pushed up the 1% grade to the make-up track. This fully assembled train, varying from 100 to 150 cars is then eased down the 1% grade into the departure yard.

These movements, particularly up the 1% grade, just about utilizes all of the Train Master's 96,475 lb tractive power. Before installation of TMs, two 1500- or 1600-hp diesel units operating in multiple were required for this job. This was an over-investment of motive power but was essential. Prior to this, a heavy type steam locomotive, Reading Class K1 (2-10-2), which had an average tractive effort of 92,750 lb had been used. This was regarded as the nearest to a solution of a difficult dispatching problem—one locomotive that would handle the job, for which the Reading had been searching for years. Two TMs working around the clock seven days per week, have effectively eliminated this problem.

These two units never leave Rutherford's east end, except for an occasional hump assignment in the same yard, or for monthly inspection.

Two other Train Masters equipped for passenger service are assigned to Bethlehem, Pa. One of these regularly handles four passenger trains daily, between Bethlehem and Philadelphia. The reason for this assignment of TM power is that while not scheduled as commuter trains, the service is similar, with as many as ten stops on one trip. The Train Master's high tractive effort and ability to accelerate rapidly, enables the maintenance of rather tight schedules.

The other Bethlehem TM unit, except when used as a relief locomotive in passenger service, works 24 hours per day, seven days a week, at Saucon Creek Yard, hauling iron ore and coal drags up a 2% grade into the nearby Bethlehem Steel Company plant. This unit is equipped with a 2-way radio-telephone to facilitate operations, by providing a communications link between engineer and the yard master.

The remaining units are regularly assigned to heavy mine-drag service on the Reading's Shamokin division, in the anthracite coal region of Pennsylvania. Here among the open pit and deep mines that surround Gordon, Tamaqua, and St. Clair (maintenance terminal) they transport coal from one colliery operation to another.

Two of the five TMs are stationed at two collieries at Gordon, from which point they haul raw coal via a 2.6% grade to breakers at St. Nicholas and Locust Summit, each about five miles away. The other three TMs of this group, are used to transport prepared and unprepared coal enroute to and from the scaling yard at St. Clair and the breaker at St. Nicholas.

Special Assignments

A special service assignment often occurs on week-ends when three TM units are coupled and operated as a 3-unit locomotive, moving prepared coal from St. Nicholas breakers to St. Clair. This 7200-hp multiple unit diesel handles an average train of 4050 tons, up a 2.9% grade to the summit at Frackville, then down a 3.3% grade to St. Clair. When descending this 3-mi 3.3% grade, in addition to using the dynamic brakes capable of dissipating 3000 hp at the rail for each TM unit, it is

Engine No. 806 pushing a heavy coal drag at St. Nicholas where raw coal is received, cleaned and prepared for shipment.

Engine No. 861, one of two units equipped for passenger service, at Bethlehem, Pa., with No. 328 for Philadelphia.

Two-way telephone between engineer and yard master at Saucon Creek yard at Bethlehem, Pa., improves utilization of the powerful units.

necessary to also use the train automatic air brakes, with retaining valves cut in on all cars. In the opposite direction the 3-unit TM moves a 2550-ton train of unprepared coal. This type of colliery service is perhaps the toughest to be found in modern railroading.

Another special service is the use of one TM occasionally to haul as many as 150 loaded cars of prepared coal, approximately 12,000 tons, from St. Clair to Bridgeport, Pa., over an 80-mile river grade. Here the train is picked up by the Philadelphia division of eastward movement to destination, some of it to tidewater for export. On the return trip (Bridgeport to St. Clair), one TM usually will handle 125 to 135 empty hopper cars.

Still another sample of the intensive utilization in special service operations is the use of the five TMs regularly assigned to St. Clair coal region on week-end handling of fast symbol and through freight trains. Opportunity to do this is due to fact that colliery operations often are limited to a 5-day week, and sometimes less.

An example of such use occurred over the 3-day week-end period November 19-22. It began on Friday evening, shortly after two Train Masters had completed their normal mine-drag duties at Gordon and St. Clair. They were coupled and proceeded immediately to Rutherford, from which point they were used as a 2-unit, 4800-hp locomotive for handling eight heavy freight trains between Rutherford—Hagerstown, Md. (81-mi), and Cumbo, W. Va. (97-mi), in the three days. The latter two points are located on the Western Maryland and Pennsylvania Railroad and are reached by joint operational use of tracks, motive power and crews. Tonnage from this important interchange moves through the Lurgan (Reading's western terminus), or nearby Shippensburg.

The total adjusted tonnage moved during period from 10:48 pm Nov. 19 to 11:02 pm Nov. 22, was 58,669 adjusted tons, composed of 498 loaded and 517 empty cars.

Summary

On all Train Master assignments, each TM has replaced lesser power units at a 1:2 ratio. Whenever any one of the TM units is out of service it is necessary to put two 1500- or 1600-hp units in its place.

During their first year of service, the Reading's nine Train Masters have established records of availability of 92% and 92.5% in passenger and freight services respectively. This was computed on a minutes-of-the-day rather than on an assignment basis.

On November 30, 1954, the 9 TMs completed a total of 422,903 unit miles of service, consuming 970,818 gal of fuel oil at a rate of 2.0 gal and 2.4 gal per unit mile in passenger and freight service respectively. Lubricating oil consumption averaged 0.014 and 0.018 gal per unit mile in passenger and freight service respectively.

Purchase of the nine TM units is the latest step in Reading's postwar dieselization program, which so far has included the acquisition of 246 diesel locomotives (354 units) of various classifications, totalling 479,160 hp. All but 40 steam locomotives have been replaced.

THE BUYERS' GUIDE

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vorm. Benz Abt Stat Motorenbau
Mannheim, Germany
NORDBERG MFG. CO.
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Milwaukee 1, Wisconsin
WHITE DIESEL ENGINE DIVISION
THE WHITE MOTOR COMPANY
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Springfield, Ohio
WORTHINGTON CORP.
421 Worthington Avenue
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MEDIUM HIGH SPEED 700 to 1200 r.p.m.

Horsepower, 1 to 50

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60-07 39th Avenue
Woodside 77, N. Y.
DAIMLER-BENZ AKTIENGESELLSCHAFT
EUROPA MOTORS, INC.
341 East 62nd Street
New York, 21, N. Y.
DIESEL ENERGY CORP.
82 Beaver Street
New York 5, N. Y.
FAIRBANKS, MORSE & CO.
600 S. Michigan Ave.
Chicago 5, Ill.
HERCULES MOTORS CORP.
11th & Market S.E.
Canton 2, Ohio
MINNEAPOLIS-MOLINE
P. O. BOX 1050
Minneapolis 1, Minn.
MOTOREN-WERKE MANNHEIM A.G.
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Mannheim, Germany
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OIL WELL SUPPLY, DIV.
UNITED STATES STEEL CORP.
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Kansas City, Missouri

Horsepower, 51 to 100

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Woodside 77, L. I., New York
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ALLIS CHALMERS MFG. CO.
154th & Commercial Avenues
Harvey, Illinois
DAIMLER-BENZ AKTIENGESELLSCHAFT
EUROPA MOTORS, INC.
341 East 62nd Street
New York, 21, N. Y.
DIESEL ENERGY CORP.
82 Beaver Street
New York 5, N. Y.
FAIRBANKS, MORSE & CO.
600 S. Michigan Ave.
Chicago 5, Ill.
HERCULES MOTORS CORP.
11th & Market S.E.
Canton 2, Ohio
MAK MASCHINENBAU KIEL A.G.
Kiel, Germany
MINNEAPOLIS-MOLINE
P. O. BOX 1050
Minneapolis 1, Minn.
MOTOREN-WERKE MANNHEIM A.G.
vorm. Benz Abt Stat Motorenbau
Mannheim, Germany

Horsepower, 101 to 500

AMERICAN M-A-N CORP.
149 Broadway
New York 6, N. Y.
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60-07 39th Avenue
Woodside 77, L. I., New York
BUDA DIVISION
ALLIS CHALMERS MFG. CO.
154th & Commercial Avenues
Harvey, Illinois
CHICAGO PNEUMATIC TOOL CO.
6 East 44th Street
N. Y., N. Y.
THE COOPER-BESSEMER CORP.
Mt. Vernon, Ohio
CUMMINS ENGINE COMPANY, INC.
5th & Union
Columbus, Indiana
DAIMLER-BENZ AKTIENGESELLSCHAFT
EUROPA MOTORS, INC.
341 East 62nd Street
New York 21, N. Y.
DIESEL ENERGY CORP.
82 Beaver Street
New York 5, N. Y.
ENTERPRISE ENGINE & MACH. CO.
18th & Florida Sts.
San Francisco 10, California
HENSCHEL MASCHINENBAU GMBH.
Hamburg, Germany
HERCULES MOTORS CORP.
11th & Market S.E.
Canton 2, Ohio
INGERSOLL-RAND CO.
11 Broadway
New York, N. Y.
MAK MASCHINENBAU KIEL A.G.
Kiel, Germany
MOTOREN-WERKE MANNHEIM A.G.
vorm. Benz Abt Stat Motorenbau
Mannheim, Germany
NORDBERG MFG. CO.
3073 S. Chase Ave.
Milwaukee 1, Wisconsin
STERLING ENGINE CO., INC.
Menominee, Mich.
WAUKESHA MOTOR CO.
St. Paul Avenue
Waukesha, Wisconsin
WHITE DIESEL ENGINE DIVISION
THE WHITE MOTOR COMPANY
1401 Sheridan Avenue
Springfield, Ohio

Horsepower, 501 to 1000

AMERICAN M-A-N CORP.
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BRUSH ABOE, INC.
60-07 39th Avenue
Woodside 77, L. I., N. Y.
CHICAGO PNEUMATIC TOOL CO.
6 East 44th Street
N. Y., N. Y.
THE COOPER-BESSEMER CORP.
Mt. Vernon, Ohio
DAIMLER-BENZ AKTIENGESELLSCHAFT
EUROPA MOTORS, INC.
341 East 62nd Street
New York, 21, N. Y.
ENTERPRISE ENGINE & MACH. CO.
18th & Florida Sts.
San Francisco 10, California
HENSCHEL MASCHINENBAU GMBH.
Hamburg, Germany
INGERSOLL-RAND CO
11 Broadway
New York 4, N. Y.
MAK MASCHINENBAU KIEL A.G.
Kiel, Germany
MOTOREN-WERKE MANNHEIM A.G.
vorm. Benz Abt Stat Motorenbau
Mannheim, Germany
NORDBERG MFG. CO.
3073 S. Chase Avenue
Milwaukee 1, Wisconsin
STERLING ENGINE CO., INC.
Menominee, Mich.
WAUKESHA MOTOR CO.
St. Paul Avenue
Waukesha, Wisconsin
WHITE DIESEL ENGINE DIVISION
THE WHITE MOTOR COMPANY
1401 Sheridan Avenue
Springfield, Ohio

Horsepower, over 1000

AMERICAN M-A-N CORP.
149 Broadway
New York 6, N. Y.
THE COOPER-BESSEMER CORP.
Mt. Vernon, Ohio
DAIMLER-BENZ AKTIENGESELLSCHAFT
EUROPA MOTORS, INC.
341 East 62nd Street
New York 21, N. Y.
ENTERPRISE ENGINE & MACH. CO.
18th & Florida Sts.
San Francisco 10, California
HENSCHEL MASCHINENBAU GMBH.
Hamburg, Germany
NORDBERG MFG. CO.
3073 S. Chase Avenue
Milwaukee 1, Wisconsin
WAUKESHA MOTOR COMPANY
St. Paul Avenue
Waukesha, Wisconsin

HIGH SPEED, over 1200 r.p.m.

Horsepower, 1 to 50

AMERICAN M-A-N CORP.
149 Broadway
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60-07 39th Avenue
Woodside 77, L. I., N. Y.
BUDA DIVISION
ALLIS CHALMERS MFG. CO.
154th & Commercial Avenues
Harvey, Illinois
CONTINENTAL MOTORS CORP.
205 Market Street
Muskegon, Michigan

DAIMLER-BENZ AKTIENGESELLSCHAFT
EUROPA MOTORS, INC.
341 East 62nd Street
New York, 21, N. Y.
DIESEL ENERGY CORP.
82 Beaver Street
New York 5, N. Y.
FAIRBANKS, MORSE & CO.
600 S. Michigan Ave.
Chicago 5, Ill.
GRAY MARINE MOTOR CO.
710 Canton Avenue
Detroit 7, Michigan
HALLETT MFG. CO.
1601 W. Florence Ave.
Inglewood, Calif.
HERCULES MOTORS CORP.
11th & Market S. E.
Canton 2, Ohio
MINNEAPOLIS-MOLINE
P. O. Box 1050
Minneapolis 1, Minn.
MOTOREN-WERKE MANNHEIM A.G.
vorm. Benz Abt Stat Motorenbau
Mannheim, Germany
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Milwaukee 1, Wisconsin
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University Ave. S.E. at 25th
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St. Paul Avenue
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WITTE ENGINE WORKS
OIL WELL SUPPLY, DIV.
UNITED STATES STEEL CORP.
1600 Oakland Ave.
Kansas City, Missouri

Horsepower, 51 to 100

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149 Broadway
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BRUSH ABOE
60-07 39th Avenue
Woodside 77, L.I., New York
BUDA DIVISION
ALLIS CHALMERS MFG. CO.
154th & Commercial Avenues
Harvey, Illinois
CONTINENTAL MOTORS CORP.
205 Market Street
Muskegon, Michigan
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EUROPA MOTORS, INC.
341 East 62nd Street
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DIESEL ENERGY CORP.
82 Beaver Street
New York 5, N. Y.
FAIRBANKS, MORSE & CO.
600 S. Michigan Ave.
Chicago 5, Ill.
GRAY MARINE MOTOR CO.
710 Canton Avenue
Detroit 7, Michigan
HERCULES MOTORS CORP.
11th & Market S. E.
Canton 2, Ohio
MINNEAPOLIS-MOLINE
P. O. Box 1050
Minneapolis 1, Minn.
MOTOREN-WERKE MANNHEIM A.G.
vorm. Benz Abt Stat Motorenbau
Mannheim, Germany
R. H. SHEPPARD CO., INC.
Hanover, Penna.
WAUKESHA MOTOR CO.
St. Paul Avenue
Waukesha, Wisconsin

Horsepower, 101 to 500

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BUDA DIVISION
ALLIS CHALMERS MFG. CO.
154th & Commercial Avenues
Harvey, Illinois
CONTINENTAL MOTORS CORP.
205 Market Street
Muskegon, Michigan
CUMMINS ENGINE CO., INC.
Columbus, Indiana
DAIMLER-BENZ AKTIENGESELLSCHAFT
EUROPA MOTORS, INC.
341 East 62nd Street
New York 21, N. Y.
DIESEL ENERGY CORP.
82 Beaver Street
New York 5, N. Y.
GRAY MARINE MOTOR CO.
710 Canton Avenue
Detroit 7, Michigan
HENSCHEL & SOHN GMBH.
HENSCHEL INTERNATIONAL CORP.
60 East 42nd Street
New York 17, N. Y.
HERCULES MOTORS CORP.
11th & Market S. E.
Canton 2, Ohio
MOTOREN-WERKE MANNHEIM A.G.
vorm. Benz Abt Stat Motorenbau
Mannheim, Germany
WAUKESHA MOTOR CO.
St. Paul Avenue
Waukesha, Wisconsin

Horsepower, 501 to 1000

CUMMINS ENGINE CO., INC.
Columbus, Indiana
DAIMLER-BENZ AKTIENGESELLSCHAFT
EUROPA MOTORS, INC.
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(Continued on Page 66)

Gigantic Display

General Motors'

General Motors 26-day "Powerama" opening in Chicago, August 31 to celebrate General Motors' overall production of 100 million horsepower, will show the American public how some of this vast amount of power has been put to work, and offer a true conception of **the role Diesel power has come to occupy in the world's economy.**

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And a favorite for young and old alik erating high-speed Diesel locomotive so that it will "run" and Visitors will "drive" it.

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Circulation of the "Powerama Issue" will be mailed to the complete DIESEL POWER subscriber list plus extra copies distributed by Divisions for use at the Show.

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Detroit 13, Michigan
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Detroit 11, Michigan

Bearings, Split
COOPER SPLIT ROLLER BEARING CORP.
2021 Milford Drive
Pittsburgh 34, Penna.

Bearings, Steel-Backed, Copper-Lead Lined
AMERICAN BEARING CORP.
429 South Harding Street
Indianapolis 7, Indiana
CLEVELAND GRAPHITE BRONZE CO.
(DIVISION OF CLEVITE CORP.)
17000 St. Clair Avenue
Cleveland 10, Ohio
DETROIT ALUMINUM & BRASS CORP.
Detroit 11, Michigan
FEDERAL-MOGUL CORP.
11031 Shoemaker Avenue
Detroit 13, Michigan

Bearings, Wrist Pin
BUNTING BRASS & BRONZE COMPANY
715 Spencer
Toledo 1, Ohio

Bellows, Brass
FULTON SYLPHON DIVISION
ROBERTSHAW-FULTON CONTROLS CO.
P. O. Box 400
Knoxville 1, Tenn.

Bellows, Stainless Steel
FULTON SYLPHON DIVISION
ROBERTSHAW-FULTON CONTROLS CO.
P. O. Box 400
Knoxville 1, Tenn.
ZALLEA BROTHERS
Taylor & Locust Sts.
Wilmington 99, Delaware

Belting, Chain
DIAMOND CHAIN COMPANY, INC.
402 Kentucky Ave.
Indianapolis, Indiana

Blowers, Centrifugal
ELLIOTT COMPANY
Jeannette, Pennsylvania
SCHWITZER-CUMMINS CO.
1125 Massachusetts Avenue
Indianapolis 7, Indiana
U. S. HOFFMAN MACHINERY CORP.
105 Fourth Avenue
New York 3, N. Y.

Blowers, Rotary, Positive
MIEHLE-DEXTER SUPERCHARGER DIVN.
THE DEXTER FOLDER COMPANY
100—4th St.
Racine, Wisconsin
SCHWITZER-CUMMINS CO.
1125 Massachusetts
Indianapolis 7, Indiana

Blowers, Scavenging and Supercharging
See Also "Superchargers"
ELLIOTT COMPANY
Jeannette, Pennsylvania
MIEHLE-DEXTER SUPERCHARGER DIVN.
THE DEXTER FOLDER COMPANY
100—4th St.
Racine, Wisconsin
SCHWITZER-CUMMINS COMPANY
1125 Massachusetts Avenue
Indianapolis, Indiana

Boilers, Exhaust Gas, Waste Heat
See also "Waste Heat Boilers"
THE SIMS COMPANY
Box 1096
Erie, Pa.

Bolts
ERIE BOLT & NUT CO.
1325 Liberty Street
Erie, Penna.
HARTFORD MACHINE SCREW CO.
Box 1440
Hartford 2, Connecticut

Bolts, High Tensile
EATON MFG. CO.
VALVE & SAGINAW DIVISIONS
9771 French Road
Detroit 13, Michigan
ERIE BOLT & NUT CO.
1325 Liberty Street
Erie, Penna.
HARTFORD MACHINE SCREW CO.
Box 1440
Hartford 2, Connecticut
MARQUETTE METAL PRODUCTS COMPANY
1145 Galewood Drive
Cleveland 10, Ohio

Brazing Copper, Atmospheric
HARTFORD MACHINE SCREW CO.
Box 1440
Hartford 2, Conn.

Breather Filters
See also, "Air Filters, Crankcase"
BRIGGS FILTRATION COMPANY
River Road
Washington 16, D. C.
VORTOX COMPANY
121 South Alexander Avenue
Claremont, California

Bronze Bar Stock, Completely Finished
BUNTING BRASS & BRONZE COMPANY
715 Spencer
Toledo 1, Ohio

Bronze Bearings
See also "Bearings, Bronze"
BUNTING BRASS & BRONZE COMPANY
715 Spencer
Toledo 1, Ohio
CLEVELAND GRAPHITE BRONZE CO.
(DIVISION OF CLEVITE CORP.)
17000 St. Clair Avenue
Cleveland 10, Ohio

Bronze Washers
BUNTING BRASS & BRONZE COMPANY
715 Spencer
Toledo 1, Ohio
CLEVELAND GRAPHITE BRONZE CO.
(DIVISION OF CLEVITE CORP.)
17000 St. Clair Avenue
Cleveland 10, Ohio

Bushings, Bronze
BUNTING BRASS & BRONZE COMPANY
715 Spencer
Toledo 1, Ohio
CLEVELAND GRAPHITE BRONZE CO.
(DIVISION OF CLEVITE CORP.)
17000 St. Clair Avenue
Cleveland 10, Ohio
JOHNSON BRONZE COMPANY
470 South Mill Street
New Castle, Penna.

Bushings, High-Lead Bronze
BUNTING BRASS & BRONZE COMPANY
715 Spencer
Toledo 1, Ohio
CLEVELAND GRAPHITE BRONZE CO.
(DIVISION OF CLEVITE CORP.)
17000 St. Clair Avenue
Cleveland 10, Ohio

Bushings, Steel-Backed, Babbitt-Lined
CLEVELAND GRAPHITE BRONZE CO.
(DIVISION OF CLEVITE CORP.)
17000 St. Clair Avenue
Cleveland 10, Ohio
JOHNSON BRONZE COMPANY
470 South Mill Street
New Castle, Penna.

Cabinets, Roller-Tool
SNAP-ON TOOLS CORPORATION
8064 28th Avenue
Kenosha, Wisconsin

Cables, Battery
WILLARD STORAGE BATTERY CO.
246-286 East 131 Street
Cleveland 1, Ohio

Camshaft Drives, Roller-Chain Type
DIAMOND CHAIN COMPANY, INC.
402 Kentucky Ave.
Indianapolis, Indiana
MORSE CHAIN COMPANY
Ithaca, New York

Camshaft Grinders
VAN NORMAN COMPANY
3640 Main Street
Springfield 7, Mass.

Camshaft Reconditioning
MORCO INC.
23001 Aurora Ave.
Bedford, Ohio

Camshafts, Forged
See also "Forgings"
PARK DROP FORGE COMPANY
Cleveland 3, Ohio

Camshafts, Reground
CLEVELAND HONE & MFG. CO.
8816 Harkness Road
Cleveland 6, Ohio

Cap Screws
CHICAGO SCREW COMPANY
2701 Washington Blvd.
Bellwood, Illinois

Carbon Solvents
See Also, "Solvents"
BRULIN & COMPANY, INC.
2939-45 Columbia Avenue
Indianapolis 7, Indiana

GUNK CHICAGO CO.
630 N. Harlem Ave.
River Forest, Ill.
OAKITE PRODUCTS, INC.
19 Rector Street
New York 6, New York

Cast Crankshafts
COOPER-BESSEMER CORPORATION
Mount Vernon, Ohio

Cast Iron Welding
BRODIE SYSTEM
115 Clifton Place
Brooklyn 38, New York

Castings, Alloy Iron
COOPER-BESSEMER CORPORATION
Mount Vernon, Ohio
GILLIETT & EATON, INC.
Lake City, Minnesota

Castings, Aluminum
GILLIETT & EATON, INC.
Lake City, Minnesota

Castings, Cracks Repaired
METALOCK REPAIR SERVICE, INC.
36-15 48th Ave.
Long Island City 1, N. Y.

Castings, Die
STEWART-WARNER CORP.
STEWART DIE CASTING DIVISION
1840 W. Diversey Pkwy.
Chicago, Ill.

Castings, Grey Iron
COOPER-BESSEMER CORPORATION
Mount Vernon, Ohio

Castings, Steel (Med & Large)
ERIE FORGE & STEEL CORPORATION
16th & Cascade Streets
Erie, Pennsylvania

Centrifugal Purifiers, Lube & Fuel Oil
See also headings under "Conditioners"; "Purifiers"; and "Separators"
THE DE LAVAL SEPARATOR CO.
The De Laval Building
Poughkeepsie, N. Y.
THE SHARPLES CORP.
2300 Westmoreland St.
Philadelphia 40, Pa.

Centrifuges, Continuous Residual Oil Purifiers
THE SHARPLES CORP.
2300 Westmoreland St.
Philadelphia 40, Pa.

Centrifuges, Oil Purifying
See heading above.
THE DE LAVAL SEPARATOR CO.
The De Laval Building
Poughkeepie, N. Y.
THE SHARPLES CORP.
2300 Westmoreland St.
Philadelphia 40, Pa.

Chain Drives, Complete
DIAMOND CHAIN CO., INC.
402 Kentucky Avenue
Indianapolis 7, Indiana
MORSE CHAIN COMPANY
Ithaca, N. Y.

Chains, Control
DIAMOND CHAIN CO., INC.
402 Kentucky Avenue
Indianapolis 7, Indiana

Chains, Dual Engine Drive
DIAMOND CHAIN CO., INC.
402 Kentucky Avenue
Indianapolis 7, Indiana
MORSE CHAIN COMPANY
Ithaca, N. Y.

Chains, Power Transmission
DIAMOND CHAIN COMPANY, INC.
402 Kentucky Avenue
Indianapolis 7, Indiana
MORSE CHAIN COMPANY
Ithaca, N. Y.

Chains, Roller
DIAMOND CHAIN COMPANY, INC.
402 Kentucky Avenue
Indianapolis 7, Indiana
MORSE CHAIN COMPANY
Ithaca, N. Y.

Chains, Silent
MORSE CHAIN COMPANY
Ithaca, N. Y.

Chains, Timing
See also "Timing Chains"
DIAMOND CHAIN COMPANY, INC.
402 Kentucky Avenue
Indianapolis 7, Indiana
MORSE CHAIN CO.
Ithaca, N. Y.

Channel Chromium
VAN DER HORST CORP. OF AMERICA
Olean, N. Y.

Chargers, Battery
WILLARD STORAGE BATTERY CO.
246 East 131 Street
Cleveland 1, Ohio

Chromium Plating
See also "Plating"
CHROMIUM CORP. OF AMERICA
1760 Lakeview Road
Cleveland 12, Ohio
KOPPERS COMPANY, INC.
P.O. Box 298
Baltimore 3, Maryland
VAN DER HORST CORP. OF AMERICA
Olean, N. Y.

Chromium Treated Parts
KOPPERS COMPANY, INC.
P. O. Box 298
Baltimore 3, Maryland
VAN DER HORST CORP. OF AMERICA
Olean, N. Y.

Clarifiers, Oil
See also headings under "Centrifugal Purifiers"; "Separators"
CENTRICO, INC.
75 W. Forest Ave.
Englewood, New Jersey
THE DE LAVAL SEPARATOR CO.
The De Laval Building
Poughkeepsie, N. Y.
THE HILLIARD CORP.
120 W. 4th St.
Elmira, N. Y.
WM. W. NUGENT & CO., INC.
410-412 N. Hermitage Ave.
Chicago 22, Ill.
U. S. HOFFMAN MACHINERY CORP.
105 4th Avenue
New York 3, N. Y.

Cleaner, Waterless, Hand
ENGINE LIFE PRODUCTS
115 S. Granada
El Monte, Calif.

Cleaners, Air, Oil Bath Type
See also headings under "Filters, Air" and "Silencers"
DONALDSON COMPANY, INC.
666 Pelham Boulevard
St. Paul 14, Minnesota
UNITED SPECIALTIES CO.
UNITED AIR CLEANERS DIVISION
9705 S. Cottage Grove Ave.
Chicago, Ill.
VORTOX COMPANY
121 S. Alexander Avenue
Claremont, California

Cleaning Compounds
See also "Solvents", "Degreasers"
BRULIN & COMPANY, INC.
2939-45 Columbia Ave.
Indianapolis 7, Ind.
CLAYTON MFG. COMPANY
401 N. Temple City Boulevard
El Monte, California
GUNK CHICAGO CO.
630 N. Harlem Ave.
River Forest, Ill.
OAKITE PRODUCTS, INC.
19 Rector Street
New York 6, N. Y.

Clutch Discs
ROCKFORD CLUTCH DIVISION
BORG-WARNER CORP.
1301 18th Avenue
Rockford, Illinois

Clutches
ROCKFORD CLUTCH DIVISION
BORG-WARNER CORP.
1301 18th Ave.
Rockford, Illinois
TWIN DISC CLUTCH COMPANY
Racine, Wisc.

Clutches, Air-Actuated
DODGE MFG. CO
Mishawaka, Ind.
TWIN DISC CLUTCH COMPANY
Racine, Wisc.

Clutches, Automatic
MORSE CHAIN CO.
Ithaca, N. Y.
ROCKFORD CLUTCH DIVISION
BORG-WARNER CORP.
1301 18th Avenue
Rockford, Illinois

Clutches, Free Wheeling
MORSE CHAIN CO.
Ithaca, N. Y.

Clutches, Friction
TWIN DISC CLUTCH COMPANY
Racine, Wisc.

Clutches, Friction and Jaw
DODGE MFG. CO
Mishawaka, Ind.
MORSE CHAIN CO.
Ithaca, N. Y.
ROCKFORD CLUTCH DIVISION
BORG-WARNER CORP.
1301 18th Avenue
Rockford, Illinois
V BELT CLUTCH CO.
418 N. Western Ave.
Los Angeles 4, Calif.

Clutches, Pneumatic
TWIN DISC CLUTCH COMPANY
Racine, Wisc.

Clutches, Power Transmission
MORSE CHAIN CO.
Ithaca, N. Y.
ROCKFORD CLUTCH DIVISION
BORG-WARNER CORP.
1301 18th Avenue
Rockford, Illinois

Clutches, Starter Engine

V-BELT CLUTCH COMPANY
418 North Western Ave.
Los Angeles 4, Calif.

Combustion, Diesel

A. B. HYDROCARBON SYSTEMS
2808 McKinney
Dallas 4, Texas
KEMIX LABORATORIES
West Springfield, Pa.

Compression Testers, Diesel Engine

See also "Indicators, Diesel Engine".

BACHARACH INDUSTRIAL INSTRUMENT CO.
7301 Penn Ave.
Pittsburgh 8, Pa.
KIENE DIESEL ACCESSORIES, INC.
10352 Pacific Ave.
Franklin Park, Illinois

Compressors, Air

See also "Starting Units"

CHICAGO PNEUMATIC TOOL CO.
6 East 44th Street
New York, N. Y.
THE COOPER-BESSEMER CORP.
Mt. Vernon, Ohio
THE GARRETT CORPORATION
AIRESEARCH INDUSTRIAL DIVISION
9225 Aviation Blvd.
Los Angeles 45, Calif.
MIEHLE-DEXTER SUPERCHARGER DIVN.
THE DEXTER FOLDING COMPANY
100—4th St.
Racine, Wisconsin
QUINCY COMPRESSOR CO.
Dept. DP
Quincy, Illinois

Compressors, Reciprocating, Air and Gas, All Drives

CHICAGO PNEUMATIC TOOL CO.
6 East 44th Street
New York, N. Y.
THE COOPER-BESSEMER CORP.
Mt. Vernon, Ohio
INGERSOLL-RAND CO.
11 Broadway
New York 4, N. Y.
WORTHINGTON CORP.
421 Worthington Ave.
Harrison, New Jersey

Condensers, Refrigeration

ROME-TURNEY RADIATOR COMPANY
Canal Street
Rome, New York

Conditioners, Fuel & Lube Oil

See also "Centrifugal Purifiers"; "Purifiers"; "Separators"

HILLIARD CORPORATION
120 West 4th Street
Elmira, N. Y.

Connecting Rod Borers

See also "Rod Boring Machines"

VAN NORMAN COMPANY
3640 Main Street
Springfield, Massachusetts

Connecting Rod Pin Bushing Borer

VAN NORMAN COMPANY
3640 Main Street
Springfield, Massachusetts

Connecting Rods, Bolts & Nuts

ERIE BOLT & NUT CO.
1325 Liberty St.
Erie, Pa.

Connecting Rods, Forged

See also "Forgings"

ERIE FORGE & STEEL CORPORATION
16th & Cascade Streets
Erie, Pennsylvania
THE PARK DROP FORGE COMPANY
Cleveland 3, Ohio

Connecting Rods, Rebuilt

CLEVELAND HONE & MFG. CO.
8816 Harkness Road
Cleveland 6, Ohio

Connections, Hose

ANCHOR COMPANY
Libertyville, Illinois

Controls, Automatic Starting

See also "Automatic Controls"; "Alarm Systems"

AUTOMATIC SWITCH CO.
391 Lakeside Avenue
Orange, New Jersey

Controls, Engine Safety

COLE-HERSEE COMPANY
20 Old Colony Avenue
Boston 27, Mass.
DETROIT CONTROLS CORP.
5900 Trumbull Avenue
Detroit 8, Michigan
FULTON-SYLPHON DIVISION
ROBERTSHAW-FULTON CONTROLS CO.
P. O. Box 400
Knoxville 4, Tennessee
ILLINOIS TESTING LABS, INC.
420 N. LaSalle Street
Chicago 10, Illinois
PENN CONTROLS, INC.
Goshen, Indiana
SYNCHRO-START PRODUCTS INC.
8151 N. Ridgeway Avenue
Skokie, Illinois

Controls, Liquid Level

DETROIT CONTROLS CORP.
5900 Trumbull Avenue
Detroit 8, Michigan
FULTON SYLPHON DIVISION
ROBERTSHAW-FULTON CONTROLS CO.
P. O. Box 400
Knoxville 1, Tennessee
THE MERCOID CORPORATION
4201 Belmont Avenue
Chicago 41, Illinois

Controls, Power, Air, Hydraulic, Vacuum, Electric

AIRMATIC VALVE, INC.
7316 Associate Ave.
Cleveland 9, Ohio

Controls, Pneumatic

AIRMATIC VALVE, INC.
7316 Associate Ave.
Cleveland 9, Ohio
POWERS REGULATOR COMPANY
3400 Oakton
Skokie, Illinois

Controls, Pressure

DETROIT CONTROLS CORP.
5900 Trumbull Avenue
Detroit 8, Michigan
FULTON SYLPHON DIVISION
ROBERTSHAW-FULTON CONTROLS CO.
P. O. Box 400
Knoxville 1, Tennessee
KYSOR HEATER COMPANY
Cadillac, Michigan
THE MERCOID CORPORATION
4201 Belmont Avenue
Chicago 41, Illinois
PENN CONTROLS, INC.
Goshen, Indiana

Controls, Temperature

DETROIT CONTROLS CORP.
5900 Trumbull Avenue
Detroit 8, Michigan
FULTON SYLPHON DIVISION
ROBERTSHAW-FULTON CONTROLS CO.
P. O. Box 400
Knoxville 4, Tennessee
ILLINOIS TESTING LABORATORIES, INC.
420 North LaSalle Street
Chicago 10, Illinois
KYSOR HEATER COMPANY
Cadillac, Michigan
THE MERCOID CORPORATION
4201 Belmont Avenue
Chicago 41, Illinois
PENN CONTROLS, INC.
Goshen, Indiana
THE POWERS REGULATOR CO.
3400 Oakton St.
Skokie, Illinois

Controls, Vacuum

DETROIT CONTROLS CORP.
5900 Trumbull Avenue
Detroit 8, Michigan

Converters, Torque

ALLISON DIVISION
GENERAL MOTORS CORP.
P. O. Box 894
Indianapolis 6, Indiana
TWIN DISC CLUTCH CO.
Racine, Wisconsin

Coolers, Compressed Air, Gas

See also "Aftercoolers"

AEROFIN CORPORATION
101 Greenway Avenue
Syracuse 3, New York
HARRISON RADIATOR DIVISION
GENERAL MOTORS CORP.
Lockport, New York
ROME TURNEY RADIATOR CO.
Rome, New York
WORTHINGTON CORPORATION
421 Worthington Ave.
Harrison, New Jersey

Coolers, Jacket Water

See also "Exchangers, Heat"; "Water Cooling Equipment"; and headings under "Heat Exchangers".

AEROFIN CORPORATION
101 Greenway Avenue
Syracuse 3, New York
HARRISON RADIATOR DIV.
GENERAL MOTORS CORP.
Washburn Street
Lockport, New York
ROME TURNEY RADIATOR CO.
Rome, New York
THE SIMS COMPANY
P. O. Box 1096
Erie, Penna.

Coolers, Lube Oil, Materials For Cleaning

GUNK CHICAGO CO.
630 Harlem Avenue
River Forest, Illinois

Coolers, Oil, Water

See also "Water Cooling Equipment"; "Exchangers, Heat" and headings under "Heat Exchangers".

HARRISON RADIATOR DIV.
GENERAL MOTORS CORP.
Washburn Street
Lockport, New York
ROME TURNEY RADIATOR CO.
Rome, New York
THE SIMS COMPANY
P. O. Box 1096
Erie, Penna.

YOUNG RADIATOR CO.
709 South Marquette Street
Racine, Wisconsin

Cooling Equipment, Engine Radiators
See also "Radiators"
HARRISON RADIATOR DIVISION
GENERAL MOTORS CORP.
Lockport, New York

Cooling System Filters & Conditioners
PERRY FILTER DIVISION
R. M. HOLLINGSHEAD CORP.
840 Cooper Street
Camden 2, New Jersey

Cooling Tower Fans
J. F. PRITCHARD & CO. of CALIF.
4625 Roanoke Pky
Kansas City 12, Missouri
SCHWITZER-CUMMINS CO.
1125 Massachusetts
Indianapolis 7, Indiana

Cooling Towers
See also "Spray Towers".
THE FLUOR CORP. LTD.
2500 So. Atlantic Blvd.
Los Angeles 22, Calif.
J. F. PRITCHARD & CO. of CALIF.
4625 Roanoke Pky
Kansas City 12, Missouri

Cooling Water Treating Chemicals
MUTUAL CHEMICAL
ALLIED CHEMICAL & DYE CORP.
99 Park Avenue
New York, N. Y.
PERRY FILTER DIVISION
R. M. HOLLINGSHEAD CORPORATION
840 Cooper Street
Camden 2, New Jersey

Core Oils
CITIES SERVICE OIL CO.
70 Pine Street
New York, N. Y.

Corrosion Inhibitors
MUTUAL CHEMICAL
ALLIED CHEMICAL & DYE CORP.
99 Park Avenue
New York, N. Y.

Couplings
AJAX FLEXIBLE COUPLING CO., INC.
Portage & English Sts.
Westfield, New York
ANCHOR COMPANY
Libertyville, Illinois
DIAMOND CHAIN COMPANY, INC.
402 Kentucky Avenue
Indianapolis, Indiana
MORSE CHAIN COMPANY
Ithaca, New York
THOMAS FLEXIBLE COUPLING CO.
Main Avenue & Biddle Street
Warren, Pennsylvania

Couplings, Chain
DIAMOND CHAIN COMPANY, INC.
402 Kentucky Avenue
Indianapolis, Indiana
DODGE MANUFACTURING CORP.
Mishawaka, Indiana
MORSE CHAIN COMPANY
Ithaca, New York

Couplings, Flexible
AJAX FLEXIBLE COUPLING CO., INC.
Portage & English Streets
Westfield, New York
DE LAVAL STEAM TURBINE CO.
Trenton 2, New Jersey
DIAMOND CHAIN CO., INC.
402 Kentucky Ave.
Indianapolis 7, Indiana
DODGE MANUFACTURING CORP.
Mishawaka, Indiana
KOPPERS CO., INC.
P.O. Box 298
Baltimore 3, Maryland
MORSE CHAIN COMPANY
Ithaca, New York
THOMAS FLEXIBLE COUPLING CO.
Main Avenue & Biddle Street
Warren, Pennsylvania

Couplings, Flexible Shaft
KOPPERS CO., INC.
P.O. Box 298
Baltimore 3, Maryland

Couplings, Floating Shaft Type
AJAX FLEXIBLE COUPLING CO., INC.
Portage & English Sts.
Westfield, New York
ANCHOR COMPANY
Libertyville, Illinois
THOMAS FLEXIBLE COUPLING CO.
Main Avenue & Biddle Street
Warren, Pa.

Couplings, Fluid
TWIN DISC CLUTCH CO.
Racine, Wisconsin

Couplings, High Pressure, Reusable
ANCHOR COMPANY
Libertyville, Illinois

Couplings, Hose, Air
ANCHOR COMPANY
Libertyville, Illinois

Couplings, Hose, Air, Hydraulic
ANCHOR COMPANY
Libertyville, Illinois

Couplings, Hose, Hydraulic
ANCHOR COMPANY
Libertyville, Illinois

Couplings, Hydraulic
ANCHOR COMPANY
Libertyville, Illinois
TWIN DISC CLUTCH CO.
Racine, Wisconsin
THE WEATHERHEAD COMPANY
FORT WAYNE DIVISION
128 West Washington Blvd.
Fort Wayne, Indiana

Couplings, Hydraulic Pipe
THE WEATHERHEAD COMPANY
FORT WAYNE DIVISION
128 West Washington Blvd.
Fort Wayne, Indiana

Couplings, Hydraulic Self Sealing Quick Disconnect
AEROQUIP CORPORATION
300 South East Avenue
Jackson, Michigan

Couplings, Pneumatic
ANCHOR COMPANY
Libertyville, Illinois
THE WEATHERHEAD COMPANY
FORT WAYNE DIVISION
128 West Washington Blvd.
Fort Wayne, Indiana

Couplings, Roller Chain
DIAMOND CHAIN CO., INC.
402 Kentucky Ave.
Indianapolis 7, Indiana
MORSE CHAIN COMPANY
Ithaca, New York

Couplings, Self-Aligning
AJAX FLEXIBLE COUPLING CO., INC.
Portage & English Streets
Westfield, New York
MORSE CHAIN COMPANY
Ithaca, New York
THOMAS FLEXIBLE COUPLING CO.
Main Avenue & Biddle Street
Warren, Pennsylvania

Couplings, Shaft, Rigid
DODGE MANUFACTURING CORP.
Mishawaka, Indiana

Crankcase Sections, Forged
THE PARK DROP FORGE COMPANY
Cleveland 3, Ohio

Cranking Motors, Air
See also "Air Starting Motors"; "Starting Motors, Air"
LEECE-NEVILLE COMPANY
5109 Hamilton Avenue
Cleveland 14, Ohio
SCHWITZER-CUMMINS CO.
1125 Massachusetts
Indianapolis 7, Indiana

Cranking Motors, Electric
See also "Starting Motors, Electric"
LEECE-NEVILLE COMPANY
5109 Hamilton Avenue
Cleveland 14, Ohio

Cranking Motors, Hydraulic
HYDRAMOTIVE, INC.
6723 Dennison Avenue
Cleveland, Ohio

Crankshaft Exchange Service
MORCO INC.
23001 Aurora Road
Bedford, Ohio

Crankshaft Grinders
SUNNEN PRODUCTS CO.
7954 Manchester
St. Louis 17, Missouri
VAN NORMAN CO.
3640 Main Street
Springfield 7, Mass.

Crankshaft Machinists
BRODIE SYSTEM
115 Clifton Place
Brooklyn 38, N. Y.

Crankshaft, Plating
VAN DER HORST CORP. OF AMERICA
Olean, New York

Crankshaft, Repairs
See also "Repairs"
BRODIE SYSTEM
115 Clifton Place
Brooklyn 38, N. Y.
ERIE FORGE & STEEL CORP.
16th & Cascade Streets
Erie 1, Pennsylvania
MORCO INC.
23001 Aurora Road
Bedford, Ohio

Crankshafts
ELLWOOD CITY FORGE CO.
Box 590
Ellwood City, Pa.
ERIE FORGE & STEEL COMPANY
16th & Cascade Streets
Erie, Pennsylvania
OHIO CRANKSHAFT CO.
3800 Harvard Avenue
Cleveland 1, Ohio
WYMAN-GORDON COMPANY
105 Madison Street
Worcester, Mass.

Crankshafts Built-Up to Standard
BRODIE SYSTEM
115 Clifton Place
Brooklyn 38, New York

Crankshafts, Cracks Repaired
METALOCK REPAIR SERVICE, INC.
36-15 48 Avenue
Long Island City 1, N. Y.

Crankshafts, Forgings
See also "Forgings"
THE PARK DROP FORGE COMPANY
Cleveland 3, Ohio

Crankshafts, Hard Chromed & Ground
See also "Plating" & "Chrome"
CLEVELAND HONE & MFG. CO.
8816 Harkness Road
Cleveland 6, Ohio

Crankshafts, Metallized
BRODIE SYSTEM
115 Clifton Place
Brooklyn 38, New York

Crankshafts Reground
BRODIE SYSTEM
115 Clifton Place
Brooklyn 38, New York

Crankshafts Straightened
BRODIE SYSTEM
115 Clifton Place
Brooklyn 38, New York

Crankshafts, Thermit Welded
BRODIE SYSTEM
115 Clifton Place
Brooklyn 38, New York

Cutting Fluids
THE PURE OIL COMPANY
35 East Wacker Drive
Chicago 1, Illinois
THE TEXAS COMPANY
135 E. 42d St.
New York 17, N. Y.

Cutting Oils
ASHLAND OIL & REFINING CO.
1409 Winchester Avenue
Ashland, Kentucky
PURE OIL COMPANY
35 East Wacker Drive
Chicago 1, Illinois
SHELL OIL COMPANY
50 West 50th St.
New York 20, N. Y.

Cylinder Heads Repaired
METALOCK REPAIR SERVICE, INC.
36-15 48 Avenue
Long Island City 1, N. Y.
RALPH STARK, INC.
43-12—32nd Street
Long Island City 1, New York

Cylinder Hones
SUNNEN PRODUCTS CO.
7954 Manchester
St. Louis 17, Missouri

Cylinder Liners
DAROS AMERICAN CORP.
8128 N. Lawndale Ave.
Skokie, Illinois

Cylinder Liners Reclaimed
BRODIE SYSTEM
115 Clifton Place
Brooklyn 38, New York
CHROMIUM CORP. OF AMERICA
1760 Lakeview Road
Cleveland 12, Ohio
VAN DER HORST CORP. OF AMERICA
Olean, New York

Cylinder Liners Repaired
ARTHUR TICKLE ENGINEERING WORKS, INC.
21 Delevan Street
Brooklyn 31, N. Y.
BRODIE SYSTEM
115 Clifton Place
Brooklyn 38, New York
METALOCK REPAIR SERVICE, INC.
36-15 48 Avenue
Long Island City 1, N. Y.

Cylinder Pressure Indicators
See also "Indicators"
KIENE DIESEL ACCESSORIES, INC.
10352 Pacific Avenue
Franklin Park, Illinois

Cylinder Sleeves
DAROS AMERICAN CORP.
8128 N. Lawndale Ave.
Skokie, Illinois

Cylinders
DAROS AMERICAN CORP.
8128 N. Lawndale Ave.
Skokie, Illinois
ERIE FORGE & STEEL CORP.
16th & Cascade Streets
Erie 1, Pennsylvania

Cylinders, Bored & Finished
BRODIE SYSTEM
115 Clifton Place
Brooklyn 38, New York

Cylinders, Repairs
BRODIE SYSTEM
115 Clifton Place
Brooklyn 38, New York
METALOCK REPAIR SERVICE, INC.
36-15 48 Avenue
Long Island City 1, N. Y.

Cylinders, Hydraulic, Single or Double-Acting
AIRMATIC VALVE, INC.
7316 Associate Ave.
Cleveland 9, Ohio

Damper, Torsional Vibration
See also "Vibration"
SCHWITZER-CUMMINS COMPANY
1125 Massachusetts Avenue
Indianapolis 7, Indiana

Dehydrators, Diesel Fuel
WARNER LEWIS COMPANY
Box 3096
Tulsa, Oklahoma

Detergents
See also "Degreasers"
OAKITE PRODUCTS, INC.
19 Rector Street
New York 6, N. Y.
STANDARD OIL CO. (INDIANA)
910 So. Michigan Avenue
Chicago 80, Ill.

Dew Point Meters
ILLINOIS TESTING LABORATORIES, INC.
420 North LaSalle Street
Chicago 10, Illinois

Diesel Buses
AMERICAN M-A-N CORPORATION
149 Broadway
New York 6, N. Y.

Diesel Engine Lubricating Oil
See also "Lubricating Oils"
GULF OIL CORP.
GULF REFINING CO.
1822 Gulf Building
Pittsburgh 30, Penna.
STANDARD OIL CO. OF CALIFORNIA
WESTERN OPERATION DIVISION
225 Bush Street
San Francisco, Calif.
STEWART-WARNER CORP.
ALEMITE DIVISION
1840 W. Diversey Pkwy.
Chicago, Illinois
THE TEXAS COMPANY
135 East 42nd Street
New York 17, N. Y.

Diesel Engines, Reconditioned
See also "Repairs Diesel"
BRODIE SYSTEM
115 Clifton Place
Brooklyn 38, New York
STEWART & STEVENSON SERVICE INC.
4516 Harrisburg
Houston, Texas

Diesel Exhaust Gas Conditioners
THE RUTH CO.
1437 Blake Street
Denver 2, Colorado

Diesel Farm Tractors
AMERICAN M-A-N CORPORATION
149 Broadway
New York 6, N. Y.
MINNEAPOLIS-MOLINE
P. O. Box 1050
Minneapolis 1, Minnesota
R. H. SHEPPARD COMPANY, INC.
201 Middle Street
Hanover, Pennsylvania

Diesel Fuel Oil
See also "Automotive Diesel Fuel"; "Fuel Oil, Diesel"; "Oils, Diesel Fuel"; "Motor Fuels".
ASHLAND OIL & REFINING COMPANY
1409 Winchester Ave.
Ashland, Kentucky
GULF OIL CORP.
GULF REFINING CO.
1822 Gulf Building
Pittsburgh 30, Pa.
PURE OIL COMPANY
35 East Wacker Drive
Chicago 1, Illinois
SHELL OIL COMPANY
50 West 50th St.
New York 20, N. Y.
SINCLAIR REFINING COMPANY
600 Fifth Avenue
New York 20, New York
TEXAS COMPANY
135 East 42nd Street
New York 17, New York

Diesel Fuel Oil Tar & Carbon Dispersing Agent
A. B. HYDROCARBON SYSTEMS
2808 McKinney
Dallas 4, Texas
KEMIX LABORATORIES
West Springfield, Penna.

Diesel Generating Sets
See also "Auxiliary Diesel Generating Sets"; "Emergency Diesel Generators"; "Emergency Lighting Plants"; "Packaged Generators".
AMERICAN M-A-N CORPORATION
149 Broadway
New York 6, N. Y.
ATLANTIC MFG. CO.
559 S. 4th Street
Hamburg, Pennsylvania
THE BUDA DIVISION
ALLIS-CHALMERS MFG. CO.
154 & Commercial Avenues
Harvey, Illinois
BURMEISTER & WAIN AMERICAN CORP.
17 Battery Place
New York 4, N. Y.
CONSOLIDATED DIESEL ELECTRIC CORP.
GENERATOR SET DIVISION
Ludlow & Canal Streets
Stamford, Conn.
COOPER-BESSEMER CORP.
Mount Vernon, Ohio

CUMMINS ENGINE CO., INC.
Columbus, Indiana
DETROIT DIESEL ENGINE DIV.
GENERAL MOTORS CORP.
13400 W. Outer Drive
Detroit 28, Mich.
ENTERPRISE ENGINE & MACH. CO.
18th & Florida Streets
San Francisco 10, Calif.
FAIRBANKS, MORSE & CO.
600 So. Michigan Ave.
Chicago 5, Illinois
HALLETT MANUFACTURING COMPANY
1601 West Florence Avenue
Inglewood, California
INGERSOLL-RAND COMPANY
11 Broadway
New York 4, New York
KATOLIGHT CORPORATION
1415 First Avenue
Mankato, Minnesota
NORDBERG MFG. CO.
3073 S. Chase Ave.
Milwaukee 1, Wisconsin
P & H DIESEL DIVISION
HARNISCHFEGER CORPORATION
500 So. Main St.
Crystal Lake, Illinois
R. H. SHEPPARD CO., INC.
201 Middle Street
Hanover, Pennsylvania
STERLING ENGINE COMPANY, INC.
Menominee, Michigan
STEWART & STEVENSON SERVICES, INC.
4516 Harrisburg
Houston, Texas
UNITED STATES MOTORS CORP.
400 Nebraska St.
Oshkosh, Wisconsin
WHITE DIESEL ENGINE DIVISION
WHITE MOTOR COMPANY
1401 Sheridan Avenue
Springfield, Ohio
WORTHINGTON CORPORATION
421 Worthington Avenue
Harrison, New Jersey

Diesel Industrial Tractors

MINNEAPOLIS-MOLINE
P. O. Box 1050
Minneapolis 1, Minnesota

Diesel Locomotives, Electrical and Mechanical Drive

GENERAL ELECTRIC COMPANY
Schenectady 5, New York

Diesel Maintenance Tools

PLOMB TOOL COMPANY
22743 Santa Fe Avenue
Los Angeles 54, Calif.

Diesel Marine Auxilaries

HALLETT MANUFACTURING CO.
1601 W. Florence Avenue
Inglewood, California

Diesel Mine Locomotives

THE RUTH CO.
1437 Blake St.
Denver 2, Colorado

Diesel Nozzle Testers

See also "Nozzle Testers", "Test Stands"
BACHARACH INDUSTRIAL INSTRUMENT CO.
7301 Penn Ave.
Pittsburgh 8, Pa.
THE BUDA DIVISION
ALLIS-CHALMERS MFG. CO.
154th & Commercial Avenues
Harvey, Illinois
C.A.V. DIVISION OF LUCAS ELECTRICAL SERVICES, INC.
14820 Detroit Ave.
Cleveland 7, Ohio
KIENE DIESEL ACCESSORIES, INC.
10352 Pacific Avenue
Franklin Park, Illinois

Diesel Pile Hammers

SYNTRON COMPANY
1000 Lexington Ave.
Homer City, Penna.

Diesel Power Units

See also "Power Units"
AMERICAN M-A-N CORPORATION
149 Broadway
New York 6, N. Y.
BUDA DIVISION
ALLIS-CHALMERS MFG. CO.
154th & Commercial Avenue
Harvey, Illinois
BURMEISTER & WAIN AMERICAN CORP.
17 Battery Place
New York 4, N. Y.
COOPER-BESSEMER CORP.
Mount Vernon, Ohio
CUMMINS ENGINE CO., INC.
Columbus, Indiana
ENTERPRISE ENGINE & MACH. CO.
18th & Florida Streets
San Francisco, California
FAIRBANKS MORSE & CO.
600 South Michigan Ave.
Chicago 5, Illinois
HERCULES MOTOR CORP.
11th & Market S.E.
Canton 2, Ohio
INGERSOLL-RAND COMPANY
11 Broadway
New York 4, New York
NORDBERG MFG. CO.
3073 S. Chase Ave.
Milwaukee 1, Wisconsin
WITTE ENGINE WORKS
OIL WELL SUPPLY DIVISION
UNITED STATES STEEL CORP.
1607 Oakland Ave.
Kansas City 26, Mo.
WORTHINGTON CORPORATION
421 Worthington Avenue
Harrison, New Jersey

Diesel Pumping Units

See also "Pumping Units"
BURMEISTER & WAIN AMERICAN CORPORATION
17 Battery Place
New York 4, New York
CONSOLIDATED DIESEL ELECTRIC CORP.
GENERATOR SET DIVISION
Ludlow & Canal Sts.
Stamford, Conn.
DELAVAL STEAM TURBINE CO.
Trenton 2, New Jersey
ENTERPRISE ENGINE & MACH. CO.
18th & Florida Streets
San Francisco 10, California
FAIRBANKS, MORSE & CO.
600 So. Michigan Ave.
Chicago 5, Illinois
INGERSOLL-RAND COMPANY
11 Broadway
New York 4, New York
NORDBERG MFG. CO.
3073 So. Chase Ave.
Milwaukee 7, Wisconsin
WHITE DIESEL ENGINE DIVISION
WHITE MOTOR COMPANY
1401 Sheridan Avenue
Springfield, Ohio
WORTHINGTON CORPORATION
421 Worthington Avenue
Harrison, New Jersey

Diesel Railway Generating Sets

COOPER-BESSEMER CORP.
Mount Vernon, Ohio
NORDBERG MFG. CO.
3073 S. Chase Ave.
Milwaukee 1, Wisconsin
STERLING ENGINE COMPANY, INC.
Menominee, Michigan

Diesel Replacement Engines, Ford And Chevrolet Trucks

HERCULES MOTOR CORP.
11th & Market S.E.
Canton 2, Ohio

Diesel Schools

UTILITIES ENGINEERING INSTITUTE DIESEL DIVISION
2525 N. Sheffield Avenue
Chicago 14, Ill.

Diesel Testing Equipment

See also "Test Stands"
BACHARACH INDUSTRIAL INSTRUMENT CO.
7301 Penn Avenue
Pittsburgh 8, Penna.
KIENE DIESEL ACCESSORIES, INC.
10352 Pacific Avenue
Franklin Park, Illinois

Drilling Machines, Sensitive, Precision

TAYLOR DYNAMOMETER & MACHINE CO.
6411 River Parkway
Milwaukee 13, Wisconsin

Drills, Portable Electric

SNAP-ON TOOLS CORP.
8064 28th Avenue
Kenosha, Wisconsin

Drives, Adjustable Speed

RELIANCE ELECTRIC & ENGINEERING CO.
1088 Ivanhoe Road
Cleveland 10, Ohio

Drives, Chain

DODGE MANUFACTURING CORP.
Mishawaka, Indiana

Drives, Gear

BRAD FOOTE GEAR WORKS
1315 South Cicero Ave.
Cicero 50, Illinois

Drives, Gearmotor

RELIANCE ELECTRIC & ENGINEERING CO.
1088 Ivanhoe Road
Cleveland 10, Ohio

Drives, V-Belt

DODGE MANUFACTURING CORP.
Mishawaka, Indiana

Dry Batteries

GLOBE-UNION INC.
900 E. Keefe Ave.
Milwaukee 1, Wisconsin
WILLARD STORAGE BATTERY CO.
246-286 East 131st Street
Cleveland 1, Ohio

Dual Chain Engine Drives

DIAMOND CHAIN CO., INC.
402 Kentucky Avenue
Indianapolis 7, Indiana
MORSE CHAIN COMPANY
Ithaca, New York

Dynamometers

CLAYTON MFG. CO.
El Monte, Calif.

Dynamometers, Chassis

CLAYTON MFG. CO.
El Monte, Calif.

Dynamometers, Engine

CLAYTON MFG. CO.
El Monte, Calif.

Dynamometers and Prony Brakes

CLAYBORNE MANUFACTURING CO.
429 North Main Street
Monticello, Indiana
W. C. DILLON & CO., INC.
14620 Keswick Street
Van Nuys, California

EATON MANUFACTURING COMPANY
739 East 140th Street
Cleveland 10, Ohio
TAYLOR DYNAMOMETER & MACHINE CO.
6411 River Parkway
Milwaukee 13, Wisconsin

Electrical Connectors

THE AMERICAN BRASS COMPANY
AMERICAN METAL HOSE DIVISION
698 South Main Street
Waterbury 20, Conn.
COLE-HERSEE COMPANY
20 Old Colony Avenue
Boston 27, Mass.
SCINTILLA DIVISION
BENDIX AVIATION CORP.
Sidney, New York

Emergency Diesel Generator Systems

See also "Auxiliary Diesel Generator Sets"; "Diesel Generating Sets"; "Emergency Lighting Plants"; "Packaged Generators".

AMERICAN M-A-N CORPORATION
149 Broadway
New York 6, N. Y.
BUDA DIVISION
ALLIS-CHALMERS MFG. CO.
154th & Commercial Ave.
Harvey, Illinois
DETROIT DIESEL ENGINE DIV.
GENERAL MOTORS CORP.
13400 W. Outer Drive
Detroit 28, Mich.
ENTERPRISE ENGINE & MACH. CO.
18th & Florida Streets
San Francisco, California
FAIRBANKS MORSE & CO.
600 South Michigan Ave.
Chicago 5, Illinois
HALLETT MANUFACTURING COMPANY
1601 West Florence Avenue
Inglewood, California
STERLING ENGINE CO.
Menominee, Michigan
STEWART & STEVENSON SERVICES, INC.
4516 Harrisburg
Houston, Texas
UNITED STATES MOTORS CORP.
400 Nebraska St.
Oshkosh, Wisconsin
WHITE DIESEL ENGINE DIVISION
THE WHITE MOTOR COMPANY
1401 Sheridan Avenue
Springfield, Ohio

Emergency Lighting Plants

See also heading above.

ATLANTIC MANUFACTURING CO.
559 S. 4th Street
Hamburg, Penna.
BUDA DIVISION
ALLIS-CHALMERS MFG. CO.
154th & Commercial Ave.
Harvey, Illinois
BURMEISTER & WAIN AMERICAN CORP.
17 Battery Place
New York 4, N. Y.
DETROIT DIESEL ENGINE DIVISION
GENERAL MOTORS CORPORATION
13400 West Outer Drive
Detroit 28, Michigan
ENTERPRISE ENGINE & MACH. CO.
18th & Florida Streets
San Francisco, California
D. W. ONAN & SONS, INC.
University Avenue S. E. at 25th
Minneapolis 14, Minnesota
STERLING ENGINE CO.
Menominee, Michigan
UNITED STATES MOTORS CORP.
400 Nebraska St.
Oshkosh, Wisconsin
WHITE DIESEL ENGINE DIVISION
THE WHITE MOTOR COMPANY
1401 Sheridan Avenue
Springfield, Ohio

Enclosed Gear Drives

BRAD FOOTE GEAR WORKS
1315 South Cicero Ave.
Cicero 50, Illinois

Engine Bolts, Nuts & Studs

ERIE BOLT & NUT CO.
1325 Liberty Street
Erie, Penna.
HARTFORD MACHINE SCREW CO.
P. O. Box 1440
Hartford 2, Connecticut
THE MARQUETTE METAL PRODUCTS CO.
1145 Galewood Drive
Cleveland 10, Ohio

Engine Cooling System Cleaners

FRAM CORPORATION
Providence 16, Rhode Island

Engine Dollies

CLAYBORNE MANUFACTURING CO.
429 North Main Street
Monticello, Indiana

Engine Frames, Cracks Repaired

METALOCK REPAIR SERVICE INC.
36-15 48th Avenue
Long Island City 1, N. Y.

Engine Repair Stands

CLAYBORNE MANUFACTURING CO.
429 North Main Street
Monticello, Indiana

Evaporators

See also "Coolers"

THE MAXIM SILENCER CO.
85 Homestead Avenue
Hartford 5, Conn.
ROME TURNEY RADIATOR CO.
Rome, New York

Evaporators, Steam

THE MAXIM SILENCER CO.
85 Homestead Ave.
Hartford 5, Conn.

Evaporators, Vapor Compression

THE MAXIM SILENCER COMPANY
Homestead Avenue
Hartford, Conn.

Exchangers, Heat

See also "Water Cooling Equipment" and headings under "Coolers" and "Heat Exchangers".

AEROFIN CORPORATION
101 Greenway Ave.
Syracuse 3, N. Y.
HARRISON RADIATOR DIVISION
GENERAL MOTORS CORP.
Washburn Street
Lockport, New York
YATES-AMERICAN MACHINE CO.
729 Fourth Street
Beloit, Wisconsin
YOUNG RADIATOR COMPANY
709 South Marquette St.
Racine, Wisconsin

Exchangers, Heat, Materials for Cleaning

See also headings under "Cleaner"; "Cooler"; "Cooling"; and "Engine"

GUNK CHICAGO CO.
630 N. Harlem Ave.
River Forest, Illinois
OAKITE PRODUCTS, INC.
19 Rector Street
New York 6, N. Y.

Exchanges, Diesel Fuel Injection Systems

BEARD & STONE ELECTRIC CO., INC.
3909 Live Oak
Dallas, Texas
INTERSTATE DIESEL SERVICE, INC.
7120 Carnegie Avenue
Cleveland 3, Ohio

Exhaust Flexible Hose

See also headings under "Flexible"; "Hose"; and "Tubing"

ALLIED METAL HOSE COMPANY
37-46 Ninth Street
Long Island City, N. Y.

Expansion Joints, Corrugated, Stainless Steel

ZALLEA BROTHERS
Taylor & Locust Sts.
Wilmington 99, Delaware

Fans, Axial Flow

SCHWITZER-CUMMINS COMPANY
1125 Massachusetts Avenue
Indianapolis 7, Indiana

Fans, Centrifugal

SCHWITZER-CUMMINS COMPANY
1125 Massachusetts Avenue
Indianapolis 7, Indiana

Fans, Radiator Cooling

See also "Radiators"

KOPPERS COMPANY, INC.
P.O. Box 298
Baltimore 3, Maryland
SCHWITZER-CUMMINS CO.
1125 Massachusetts Ave.
Indianapolis 7, Indiana

Farm Implements

MINNEAPOLIS-MOLINE
P. O. Box 1050
Minneapolis 1, Minnesota

Filtering Systems

See headings under "Filters"

THE BRIGGS FILTRATION COMPANY
River Road
Washington 16, D. C.
ENGINE LIFE PRODUCTS
115 South Granada
El Monte, Calif.
HILLIARD CORPORATION
120 W. 4th Street
Elmira, New York
HOUDAILLE-HERSHEY OF INDIANA, INC.
415 Indianapolis Avenue
Lebanon, Indiana
LUBER FINER INC.
2514 So. Grand
Los Angeles 7, Calif.
PUROLATOR PRODUCTS, INC.
970 New Brunswick Ave.
Rahway, New Jersey

Filters, Air

See also "Air Cleaners"; "Air Filters"; and Headings under "Breathers".

CUNO ENGINEERING CORP.
80 South Vine Street
Meriden, Conn.
DOLLINGER CORPORATION
11 Centre Park
Rochester 3, N. Y.
FRAM CORPORATION
Providence 16, Rhode Island
PUROLATOR PRODUCTS, INC.
970 New Brunswick Avenue
Rahway, New Jersey
UNITED SPECIALTIES
UNITED AIR CLEANER DIVISION
9705 South Cottage Grove Ave.
Chicago, Ill.

Filters, Air, Automatic Self-Cleaned

AIR-MAZE CORPORATION
25000 Miles Road
Cleveland 28, Ohio
DOLLINGER CORPORATION
11 Centre Park
Rochester 3, N. Y.

Filters, Air, Dry Type

DOLLINGER CORPORATION
11 Centre Park
Rochester 3, New York
FRAM CORPORATION
Providence 16, R. I.
WINSLOW ENGINEERING CO.
4069 Hollis St.
Oakland, Calif.

Filters, Air, Dry Type (Crankcase)

DOLLINGER CORPORATION
11 Centre Park
Rochester 3, N. Y.
FRAM CORPORATION
Providence 16, R. I.
PUROLATOR PRODUCTS, INC.
970 New Brunswick Ave.
Rahway, New Jersey

Filters, Air, Materials For Cleaning

DOLLINGER CORPORATION
11 Centre Park
Rochester 3, N. Y.

Filters, Air, Oil Bath Type

AIR MAZE CORP.
25000 Miles Road
Cleveland 5, Ohio
DONALDSON COMPANY, INC.
666 Pelham Blvd.
St. Paul 14, Minnesota
UNITED SPECIALTIES
UNITED AIR CLEANER DIVISION
9705 South Cottage Grove Ave.
Chicago, Illinois
VORTOX COMPANY
121 South Alexander Avenue
Claremont, California

Filters, Air, Open-Screen Type

DOLLINGER CORPORATION
11 Centre Park
Rochester 3, N. Y.

Filters, Air, Panel Type

AIR-MAZE CORPORATION
25000 Miles Road
Cleveland 28, Ohio
DOLLINGER CORPORATION
11 Centre Park
Rochester 3, New York
VORTOX COMPANY
121 South Alexander Avenue
Claremont, California

Filters, (Centrifugal) Lube Oil

DOLLINGER CORPORATION
11 Centre Park
Rochester 3, N. Y.
THE SHARPLES CORPORATION
2300 Westmoreland Street
Philadelphia, Penna.

Filters, Compressed Air

BRIGGS FILTRATION CO.
River Road
Washington 16, D. C.
COMMERCIAL FILTERS CORP.
2 Main Street
Melrose 76, Massachusetts
CUNO ENGINEERING CORP.
80 South Vine Street
Meriden, Connecticut
DOLLINGER CORPORATION
11 Centre Park
Rochester 3, New York
PUROLATOR PRODUCTS, INC.
970 New Brunswick Avenue
Rahway, New Jersey
WINSLOW ENGINEERING CO.
4069 Hollis St.
Oakland, Calif.

Filters, 5-Micron, Diesel Fuel

BRIGGS FILTRATION CO.
River Road
Washington 16, D. C.
C. A. V. DIVISION OF LUCAS ELECTRICAL SERVICES, INC.
14820 Detroit Avenue
Cleveland 7, Ohio
COMMERCIAL FILTERS CORPORATION
2 Main St.
Melrose 76, Massachusetts
DOLLINGER CORPORATION
11 Centre Park
Rochester 3, N. Y.
FRAM CORPORATION
Providence 16, R. I.
HOUDAILLE-HERSHEY OF INDIANA, INC.
415 Indianapolis Avenue
Lebanon, Indiana
LUBER-FINER, INC.
2514 S. Grand Avenue
Los Angeles 7, California
WM. W. NUGENT & CO., INC.
410-12 N. Hermitage Ave.
Chicago, Illinois
PUROLATOR PRODUCTS, INC.
970 New Brunswick Avenue
Rahway, New Jersey
U. S. HOFFMAN MACHINERY CORP.
INDUSTRIAL FILTRATION DIVISION
105 Fourth Avenue
New York, N. Y.
WARNER LEWIS COMPANY
Box 3096
Tulsa, Oklahoma
WIX CORPORATION
Gastonia, N. C.

Filters, Fuel Oil

See also "Oil Filters".

AIR MAZE CORPORATION
25000 Miles Road
Cleveland, Ohio
AMERICAN BOSCH DIVISION
AMERICAN BOSCH ARMA CORP.
3664 Main Street
Springfield 7, Mass.
BRIGGS FILTRATION COMPANY
River Road
Washington 16, D. C.
C. A. V., DIVISION OF LUCAS ELECTRICAL SERVICES, INC.
14820 Detroit Avenue
Cleveland 7, Ohio
COMMERCIAL FILTERS CORP.
2 Main Street
Melrose 76, Massachusetts
CUNO ENGINEERING CORP.
80 South Vine Street
Meriden, Conn.
DULUTH FILTER COMPANY
2911 West Superior Street
Duluth 3, Minnesota
ENGINE LIFE PRODUCTS
115 S. Granada
El Monte, Calif.
FRAM CORP.
Providence 16, Rhode Island
THE HILLIARD CORP.
120 West 4th Street
Elmira, N. Y.
HOUDAILLE-HERSHEY OF INDIANA, INC.
415 Indianapolis Avenue
Lebanon, Indiana
LUBER-FINER, INC.
2514 South Grand Ave.
Los Angeles, California
WM. W. NUGENT & CO., INC.
410-12 N. Hermitage Ave.
Chicago, Illinois
PUROLATOR PRODUCTS, INC.
970 New Brunswick Ave.
Rahway, N. J.
THE SHARPLES CORPORATION
2300 Westmoreland St.
Philadelphia 40, Penna.
U. S. HOFFMAN MACHINERY CORP.
INDUSTRIAL FILTRATION DIVISION
105 Fourth Avenue
New York, N. Y.
WARNER LEWIS COMPANY
Box 3096
Tulsa, Oklahoma
WINSLOW ENGINEERING CO.
4069-73 Hollis Street
Oakland 8, Calif.
WIX CORPORATION
Gastonia, N. C.

Filters, Gasoline

THE BRIGGS FILTRATION CO.
River Road
Washington 16, D. C.
COMMERCIAL FILTERS CORP.
2 Main Street
Melrose 76, Massachusetts
CUNO ENGINEERING CORP.
80 South Vine Street
Meriden, Connecticut
DOLLINGER CORPORATION
11 Centre Park
Rochester 3, New York
FRAM CORP.
Providence 16, R. I.
THE HILLIARD CORPORATION
120 West 4th Street
Elmira, New York
HOUDAILLE-HERSHEY OF INDIANA, INC.
415 Indianapolis Avenue
Lebanon, Indiana
LUBER-FINER, INC.
2514 S. Grand Avenue
Los Angeles 7, Calif.
WM. W. NUGENT & CO., INC.
410-12 N. Hermitage Ave.
Chicago, Illinois
PUROLATOR PRODUCTS, INC.
970 New Brunswick Ave.
Rahway, New Jersey
WARNER LEWIS COMPANY
Box 3096
Tulsa, Oklahoma

Filters, Lubricating Oil

See also "Oil Filters".

AIR MAZE CORP.
25000 Miles Road
Cleveland 5, Ohio
BRIGGS FILTRATION COMPANY
River Road
Washington 16, D. C.
COMMERCIAL FILTERS CORP.
2 Main Street
Melrose 76, Mass.
CUNO ENGINEERING CORP.
80 South Vine Street
Meriden, Conn.
DOLLINGER CORPORATION
11 Centre Park
Rochester 3, N. Y.
DULUTH FILTER COMPANY
2911 West Superior Street
Duluth 3, Minnesota
ENGINE LIFE PRODUCTS
115 S. Granada
El Monte, Calif.
FRAM CORP.
Providence 16, Rhode Island
THE HILLIARD CORP.
120 West 4th Street
Elmira, N. Y.
HOUDAILLE-HERSHEY OF INDIANA, INC.
415 Indianapolis Avenue
Lebanon, Indiana
LUBER-FINER, INC.
2514 South Grand Ave.
Los Angeles, California

WM. N. NUGENT & CO., INC.
410-12 N. Hermitage Ave.
Chicago 22, Illinois
PUROLATOR PRODUCTS, INC.
970 New Brunswick Ave.
Rahway, N. J.
U. S. HOFFMAN MACHINERY CORP.
105 Fourth Avenue
New York 3, N. Y.
WARNER LEWIS COMPANY
Box 3096
Tulsa, Oklahoma
WINSLOW ENGINEERING CO.
4069-73 Hollis Street
Oakland 8, Calif.
WIX CORPORATION
Gastonia, N. C.

Filters, Lubricating Oil, Magnetic

A. B. HYDROCARBON SYSTEMS
2808 McKinney
Dallas 4, Texas

Filters, Panel Type

AIR MAZE CORPORATION
25000 Miles Road
Cleveland 28, Ohio
DOLLINGER CORPORATION
11 Centre Park
Rochester 3, New York

Filter, Silencer Dry Type

DOLLINGER CORPORATION
11 Centre Park
Rochester 3, New York
WINSLOW ENGINEERING CO.
4069 Hollis St.
Oakland, Calif.

Fittings, Hose

ANCHOR COMPANY
Libertyville, Illinois

Fittings, Hose, Detachable

AEROQUIP CORPORATION
300 South East Avenue
Jackson, Michigan
ANCHOR COMPANY
Libertyville, Illinois
THE WEATHERHEAD COMPANY
FORT WAYNE DIVISION
128 West Washington Blvd.
Fort Wayne, Indiana

Fittings, Tube & Pipe

ANDERSON BRASS COMPANY
5308 Twelfth Street
Detroit 8, Michigan

Flexible Connections, Stainless Steel

See also headings under "Hose" and "Tubing"
ATLANTIC METAL HOSE CO. INC.
309 Dyckman Street
New York 34, New York
ZALLEA BROTHERS
Taylor & Locust Streets
Wilmington 99, Delaware

Flexible Exhaust Connections

See also headings under "Hose" and "Tubing"
ALLIED METAL HOSE COMPANY
37-46 Ninth Street
Long Island City 1, N. Y.
ATLANTIC METAL HOSE CO., INC.
309 Dyckman Street
New York 34, New York
ZALLEA BROTHERS
Taylor & Locust Streets
Wilmington 99, Delaware

Flexible Hose Lines

AEROQUIP CORPORATION
300 S. East Avenue
Jackson, Michigan

Flexible Metal Hose

See also "Hose, Flexible, Metallic".
ALLIED METAL HOSE COMPANY
37-46 Ninth Street
Long Island City 1, N. Y.
AMERICAN BRASS COMPANY
AMERICAN METAL HOSE DIVISION
698 South Main Street
Waterbury 20, Connecticut
ATLANTIC METAL HOSE CO., INC.
309 Dyckman Street
New York 34, New York

Flexible Metal Hose, Fuel Oil, Lubricating Oil, Compressed Air & Water Lines

See also headings under "Hose" and "Tubing".
ALLIED METAL HOSE COMPANY
37-46 Ninth Street
Long Island City 1, N. Y.
THE AMERICAN BRASS COMPANY
AMERICAN METAL HOSE DIVISION
698 South Main Street
Waterbury 20, Conn.
ATLANTIC METAL HOSE CO., INC.
309 Dyckman Street
New York 34, New York

Fluid Drive

DODGE MANUFACTURING CORP.
Mishawaka, Indiana

Forgings

ERIE FORGE & STEEL CORPORATION
16th & Cascade Streets
Erie 1, Pennsylvania

Forgings, Aluminum

ALUMINUM COMPANY OF AMERICA
Pittsburgh 19, Penna.
WYMAN-GORDON COMPANY
105 Madison Street
Worcester 8, Mass.

Forgings, Die

THE PARK DROP FORGE COMPANY
Cleveland 3, Ohio

Forgings, Drop

BONNEY FORGE & TOOL WORKS
716 Meadow Street
Allentown, Penna.
THE PARK DROP FORGE COMPANY
Cleveland 3, Ohio
WYMAN-GORDON COMPANY
105 Madison Street
Worcester 8, Mass.

Forgings, Iron & Steel

WYMAN-GORDON COMPANY
105 Madison Street
Worcester 8, Mass.

Forgings, Steel

ELLWOOD CITY FORGE COMPANY
Box 590
Ellwood City, Pennsylvania
THE PARK DROP FORGE COMPANY
Cleveland 3, Ohio

Frame Members Forged

THE PARK DROP FORGE COMPANY
Cleveland 3, Ohio

Fuel Injection Systems, Repair & Service

See also "Service, Injection System"
BEARD & STONE ELECTRIC CO., INC.
3909 Live Oak
Dallas, Texas
DIESEL CONTROL CORPORATION
226 N. Marine Avenue
Wilmington, California
INTERSTATE DIESEL SERVICE, INC.
7120 Carnegie Avenue
Cleveland 3, Ohio

Fuel Oil Additives

See also "Conditioners"
KEMIX LABORATORIES
West Springfield, Penna.

Fuel Oil, Diesel

See also "Automotive Diesel Fuel"; "Oils, Diesel Fuels"; "Diesel Fuel Oil".
ASHLAND OIL & REFINING CO.
1409 Winchester Ave.
Ashland, Kentucky
CITIES SERVICE OIL CO.
70 Pine Street
New York 5, N. Y.
GULF OIL CORP.
GULF REFINING CO.
1822 Gulf Building
Pittsburgh 30, Pa.
THE PURE OIL COMPANY
35 East Wacker Drive
Chicago 1, Illinois
SHELL OIL COMPANY
50 West 50th St.
New York 20, N. Y.
STANDARD OIL CO. (INDIANA)
910 South Michigan Ave.
Chicago 80, Illinois
THE TEXAS COMPANY
135 E. 42d St.
New York 17, N. Y.

Fuel Oil Purifiers

DE LAVAL SEPARATOR CO.
The De Laval Building
Poughkeepsie, N. Y.

Fuel Oil Tar & Carbon Dispersing Agent

KEMIX LABORATORIES
West Springfield, Penna.

Fuel Oil Treatment, Diesel

CENTRICO, INC.
75 West Forest Avenue
Englewood, New Jersey
KEMIX LABORATORIES
West Springfield, Penna.
PETROLEUM SOLVENTS CORPORATION
331 Madison Avenue
New York, N. Y.

Fuel Research Engines

WAUKESHA MOTOR COMPANY
St. Paul Avenue
Waukesha, Wisconsin

Gages, Air Pressure

BACHARACH INDUSTRIAL INSTRUMENT
7301 Penn Avenue
Pittsburgh 8, Penna.
ROCHESTER MFG. CO., INC.
9 Rockwood Place
Rochester 10, New York

Gages, Draft, Portable Indicating

BACHARACH INDUSTRIAL INSTRUMENT CO.
7301 Penn Avenue
Pittsburgh 8, Pa.
THE MERIAM INSTRUMENT CO.
10920 Madison Ave.
Cleveland 2, Ohio
STEWART-WARNER CORP.
1840 W. Diversey Parkway
Chicago, Illinois

Gages, Fuel

ROCHESTER MANUFACTURING COMPANY, INC.
9 Rockwood Place
Rochester 10, New York
STEWART-WARNER CORP.
1840 W. Diversey Parkway
Chicago, Illinois

Gages, Liquid Level
THE MERIAM INSTRUMENT CO.
10920 Madison Ave.
Cleveland 2, Ohio
NATHAN MANUFACTURING CORP.
45-02 Ditmars Blvd.
Long Island City 5, N. Y.
ROCHESTER MFG. CO., INC.
9 Rockwood Place
Rochester 10, New York
STEWART-WARNER CORP.
1840 W. Diversey Pkwy.
Chicago, Ill.

Gages, Oil Pressure
ROCHESTER MFG. CO., INC.
9 Rockwood Place
Rochester 10, New York
STEWART-WARNER CORP.
1840 W. Diversey Pkwy.
Chicago, Ill.

Gages, Tank Contents
THE MERIAM INSTRUMENT CO.
10920 Madison Ave.
Cleveland 2, Ohio
ROCHESTER MFG. CO., INC.
9 Rockwood Place
Rochester 10, New York
STEWART-WARNER CORP.
1840 W. Diversey Pkwy.
Chicago, Ill.

Gages, Temperature
See also, "Thermometers".
BACHARACH INDUSTRIAL INSTRUMENT CO.
7301 Penn Avenue
Pittsburgh 8, Pa.
ILLINOIS TESTING LABORATORIES, INC.
420 North LaSalle Street
Chicago 10, Illinois
ROCHESTER MFG. CO., INC.
9 Rockwood Place
Rochester 10, New York
STEWART-WARNER CORP.
1840 W. Diversey Pkwy.
Chicago, Ill.

Gages, Vacuum
BACHARACH INDUSTRIAL INSTRUMENT CO.
7301 Penn Ave.
Pittsburgh 8, Pa.
THE MERIAM INSTRUMENT CO.
10920 Madison Ave.
Cleveland 2, Ohio
STEWART-WARNER CORP.
1840 W. Diversey Pkwy.
Chicago, Ill.

Gages, Viscosity, Oil
THE GERIN CORPORATION
Avon, N. J.

Gaskets
THE ANCHOR PACKING CO.
401 North Broad St.
Philadelphia 8, Pa.
CHICAGO CORK WKS. CO.
5289 N. Arondale Ave.
Chicago 30, Ill.
THE FITZGERALD MFG. CO.
Torrington, Conn.
WISCONSIN GASKET & MFG. CO.
Granville, Wisconsin

Gaskets, Asbestos
See also, "Asbestos Sheet".
THE ANCHOR PACKING CO.
401 N. Broad St.
Philadelphia, Pa.
VICTOR MFG. & GASKET CO.
5750 W. Roosevelt Blvd.
Chicago, Illinois
WISCONSIN GASKET & MFG. CO.
Granville, Wisconsin

Gaskets, Cork
THE ANCHOR PACKING CO.
401 N. Broad St.
Philadelphia, Pa.
CHICAGO CORK WKS. CO.
5289 N. Arondale Ave.
Chicago 30, Ill.
WISCONSIN GASKET & MFG. CO.
Granville, Wisconsin

Gaskets, Fibrous
THE ANCHOR PACKING CO.
401 N. Broad St.
Philadelphia, Pa.
CHICAGO CORK WKS. CO.
5289 N. Arondale Ave.
Chicago 30, Ill.
WISCONSIN GASKET & MFG. CO.
Granville, Wisconsin

Gaskets, Metallic
THE ANCHOR PACKING CO.
401 N. Broad St.
Philadelphia, Pa.
THE FITZGERALD MFG. CO.
Torrington, Conn.
VICTOR MFG. & GASKET CO.
5750 W. Roosevelt Blvd.
Chicago, Illinois

Gaskets, Oil and Water
THE ANCHOR PACKING CO.
401 N. Broad St.
Philadelphia, Pa.
VICTOR MFG. & GASKET CO.
5750 W. Roosevelt Blvd.
Chicago, Illinois
WISCONSIN GASKET & MFG. CO.
Granville, Wisconsin

Gear Blanks, Forged
ERIE FORGE & STEEL CORPORATION
16th & Cascade Streets
Erie 1, Pennsylvania

Geared Transmissions, Auxiliary
BRAD FOOTE GEAR WORKS
1315 S. Cicero Ave.
Cicero 50, Ill.

Geared Transmissions, Unit
BRAD FOOTE GEAR WORKS
1315 S. Cicero Ave.
Cicero 50, Ill.

Gearmotors
RELIANCE ELECTRIC & ENGINEERING COMPANY
1088 Ivanhoe Road
Cleveland 10, Ohio

Gears
BRAD FOOTE GEAR WORKS
1315 S. Cicero Ave.
Cicero 50, Ill.

Gears, Aircraft Quality
BRAD FOOTE GEAR WORKS
1315 S. Cicero Ave.
Cicero 50, Ill.

Gears, Bevel
BRAD FOOTE GEAR WORKS
1315 S. Cicero Ave.
Cicero 50, Ill.

Gears, Cut
BRAD FOOTE GEAR WORKS
1315 S. Cicero Ave.
Cicero 50, Ill.
SCHWITZER CUMMINS CO.
1125 Massachusetts
Indianapolis 7, Ind.

Gears, Forged
See also "Forgings"
THE PARK DROP FORGE CO.
Cleveland 3, Ohio

Gears, Heat Treated
BRAD FOOTE GEAR WORKS
1315 S. Cicero Ave.
Cicero 50, Ill.

Gears, Helical
BRAD FOOTE GEAR WORKS
1315 S. Cicero Ave.
Cicero 50, Ill.

Gears, Herringbone
BRAD FOOTE GEAR WORKS
1315 S. Cicero Ave.
Cicero 50, Ill.

Gears, Internal
BRAD FOOTE GEAR WORKS
1315 S. Cicero Ave.
Cicero 50, Ill.

Gears, Marine
TWIN DISC CLUTCH CO.
Racine, Wisconsin

Gears, Non-Metallic
BRAD FOOTE GEAR WORKS
1315 S. Cicero Ave.
Cicero 50, Ill.

Gears, Planetary
BRAD FOOTE GEAR WORKS
1315 S. Cicero Ave.
Cicero 50, Ill.

Gears, Reduction
BRAD FOOTE GEAR WORKS
1315 S. Cicero Ave.
Cicero 50, Ill.
COTTA TRANSMISSION CO.
2340 - 11th St.
Rockford, Ill.
ROCKFORD CLUTCH DIVISION
BORG-WARNER CORP.
1301 18th Avenue
Rockford, Illinois
THE SNOW-NABSTEDT GEAR CORP.
251 Welton St.
Hamden, Conn.
TWIN DISC CLUTCH CO.
Racine, Wisconsin
WORTHINGTON CORPORATION
421 Worthington Ave.
Harrison, N. J.

Gears, Speed Increaser
BRAD FOOTE GEAR WORKS
1315 S. Cicero Ave.
Cicero 50, Ill.

Gears, Speed Reduction
BRAD FOOTE GEAR WORKS
1315 S. Cicero Ave.
Cicero 50, Ill.

Gears, Spiral
BRAD FOOTE GEAR WORKS
1315 S. Cicero Ave.
Cicero 50, Ill.

Gears, Spiral Bevel
BRAD FOOTE GEAR WORKS
1315 S. Cicero Ave.
Cicero 50, Ill.

Gears, Spur
BRAD FOOTE GEAR WORKS
1315 S. Cicero Ave.
Cicero 50, Ill.

Gears, Worm
BRAD FOOTE GEAR WORKS
1315 S. Cicero Ave.
Cicero 50, Ill.

Generating Sets, Electric
See also "Diesel Generator Sets"; "Auxiliary Diesel Generating Sets"; "Emergency Diesel Generators"; "Emergency Lighting Plants"; "Packaged Generators"
ATLANTIC MANUFACTURING CO.
559 South 4th Street
Hamburg, Pennsylvania
BUDA DIVISION
ALLIS-CHALMERS MFG. CO.
154th & Commercial Ave.
Harvey, Ill.

BURMEISTER & WAIN AMERICAN CORP.
17 Battery Place
New York 4, N. Y.
CHICAGO PNEUMATIC TOOL CO.
6 East 44th Street
New York, New York
CONSOLIDATED DIESEL ELECTRIC CORP.
GENERATOR SET DIVISION
Ludlow & Canal Streets
Stamford, Conn.
CUMMINS ENGINE CO., INC.
5th & Union
Columbus, Indiana
ENTERPRISE ENGINE & MACHINERY CO.
18th & Florida Streets
San Francisco, California
FAIRBANKS MORSE & COMPANY
600 South Michigan Avenue
Chicago 5, Illinois
KATO ENGINEERING CO.
1415 First Ave.
Mankato, Minnesota
NORDBERG MFG. CO.
3073 South Chase Avenue
Milwaukee, Wisconsin
D. W. ONAN & SONS, INC.
University Ave., S.E. at 25th
Minneapolis 14, Minnesota
WHITE DIESEL ENGINE DIVISION
THE WHITE MOTOR CO.
1401 Sheridan Ave.
Springfield, Ohio
WITTE ENGINE WORKS
OIL WELL SUPPLY DIVISION
UNITED STATES STEEL CORP.
1607 Oakland Ave.
Kansas City 26, Mo.
WORTHINGTON CORPORATION
421 Worthington Ave.
Harrison, N. J.

Generators, A. C.

COLUMBIA ELECTRIC MFG. CO.
4519 Hamilton Ave.
Cleveland 14, Ohio
ELECTRIC MACHINERY MFG. CO.
800 Central Avenue
Minneapolis 13, Minn.
ELLIOTT COMPANY
Jeannette, Pennsylvania
THE IDEAL ELECTRIC & MFG. CO.
First & Oak St.
Mansfield, Ohio
KATO ENGINEERING CO.
1415 First Ave.
Mankato, Minnesota
THE LEECE-NEVILLE CO.
5109 Hamilton Ave.
Cleveland 14, Ohio
LOUIS ALLIS COMPANY
427 E. Stewart St.
Milwaukee 7, Wisconsin
UNITED STATES MOTORS CORP.
400 Nebraska St.
Oshkosh, Wisconsin

Generators, Charging

AMERICAN BOSCH DIVISION
AMERICAN BOSCH ARMA CORP.
3664 Main Street
Springfield, Massachusetts
KATO ENGINEERING CO.
1415 First Ave.
Mankato, Minnesota

Generators, Charging, Direct Current Rectified A. C.

DELCO-REMY DIVISION
GENERAL MOTORS CORPORATION
2401 Columbus Avenue
Anderson, Indiana
KATO ENGINEERING CO.
1415 First Ave.
Mankato, Minnesota
LEECE-NEVILLE COMPANY
5109 Hamilton Avenue
Cleveland 14, Ohio

Generators, D. C.

COLUMBIA ELECTRIC MFG. CO.
4519 Hamilton Avenue
Cleveland 14, Ohio
DELCO-REMY DIVISION
GENERAL MOTORS CORPORATION
2401 Columbus Avenue
Anderson, Indiana
THE ELLIOTT COMPANY
Jeannette, Pennsylvania
THE IDEAL ELECTRIC & MFG. CO.
First & Oak Street
Mansfield, Ohio
KATO ENGINEERING CO.
1415 First Ave.
Mankato, Minnesota
THE LEECE-NEVILLE CO.
5109 Hamilton Ave.
Cleveland 14, Ohio
LOUIS ALLIS COMPANY
427 E. Stewart St.
Milwaukee 7, Wisconsin
RELIANCE ELECTRIC & ENGINEERING CO.
1088 Ivanhoe Road
Cleveland 10, Ohio

Generators, Diesel-Driven (Mobile)

ELECTRO-MOTIVE DIVISION
GENERAL MOTORS CORP.
LaGrange, Illinois

Generators, Diesel Driven (Stationary)

ELECTRO-MOTIVE DIVISION
GENERAL MOTORS CORP.
LaGrange, Illinois

Generators, Engine Driven

ATLANTIC MFG. CO.
559 South 4th Street
Hamburg, Pennsylvania
BUDA DIVISION
ALLIS-CHALMERS MFG. CO.
154th & Commercial Avenue
Harvey, Illinois
CONSOLIDATED DIESEL ELECTRIC CORP.
GENERATOR SET DIVISION
Ludlow & Canal Streets
Stamford, Conn.
ELECTRIC MACHINERY MFG. CO.
800 Central Avenue
Minneapolis 13, Minn.
KATO ENGINEERING CO.
1415 First Ave.
Mankato, Minnesota
LOUIS ALLIS COMPANY
427 E. Stewart St.
Milwaukee 7, Wisconsin
STERLING ENGINE COMPANY, INC.
Menominee, Michigan
UNITED STATES MOTORS CORP.
400 Nebraska St.
Oshkosh, Wisconsin
WHITE DIESEL ENGINE DIVISION
THE WHITE MOTOR CO.
1401 Sheridan Ave.
Springfield, Ohio

Governors, Centrifugal

FARRIS PICKERING GOVERNOR CO.
400 Commercial Ave.
Palisades Park, N. J.

Governors, Hydraulic

FARRIS PICKERING GOVERNOR CO.
400 Commercial Ave.
Palisades Park, N. J.
THE MARQUETTE METAL PRODUCTS
1145 Galewood Drive
Cleveland 10, Ohio
WOODWARD GOVERNOR CO.
5001 N. Second St.
Rockford, Illinois

Governors, Overspeed

FARRIS PICKERING GOVERNOR CO.
400 Commercial Ave.
Palisades Park, N. J.
THE MARQUETTE METAL PRODUCTS
1145 Galewood Drive
Cleveland 10, Ohio
WOODWARD GOVERNOR CO.
5001 N. Second St.
Rockford, Illinois

Governors, Overspeed, Engine Shut-Off

SYNCHRO-START PRODUCTS, INC.
8151 N. Ridgeway Ave.
Skokie, Ill.

Governors, Pressure Controlled

WOODWARD GOVERNOR COMPANY
5001 N. Second St.
Rockford, Ill.

Greases

See also "Lubricants"; "Automotive Greases".

CITIES SERVICE OIL CO.
70 Pine Street
New York, N. Y.
GULF OIL CORP.
GULF REFINING CO.
1822 Gulf Bldg.
Pittsburgh 30, Pa.
MACMILLAN PETROLEUM CORP.
530 W. Sixth St.
Los Angeles 14, California
PURE OIL COMPANY
35 East Wacker Drive
Chicago 1, Illinois
SHELL OIL CO.
50 W. 50th St.
New York 20, N. Y.
SINCLAIR REFINING COMPANY
600 Fifth Avenue
New York 20, New York
STANDARD OIL COMPANY OF CALIF.
WESTERN OPERATION DIVISION
225 Bush Street
San Francisco 20, California
THE TEXAS COMPANY
135 E. 42d St.
New York 17, N. Y.

Hardened & Ground Parts

HARTFORD MACHINE SCREW CO.
Box 1440
Hartford 2, Conn.
MARQUETTE METAL PRODUCTS CO.
1145 Galewood Drive
Cleveland 10, Ohio

Heads, Cracks Repaired

METALOCK REPAIR SERVICE, INC.
36-15 48th Ave.
Long Island City 1, N. Y.

Heat Exchanger Cleaner

See also "Cleaner", "Solvent"

GUNK CHICAGO CO.
630 N. Harlem Ave.
River Forest, Ill.

Heat Exchangers, Air Cooled

See also, "Exchangers, Heat".

AEROFIN CORPORATION
101 Greenway Ave.
Syracuse 3, N. Y.
HARRISON RADIATOR DIVISION
GENERAL MOTORS CORPORATION
Lockport, N. Y.
UNITED AIRCRAFT PRODUCTS, INC.
1116 Bolander Ave.
Dayton 1, Ohio

Heat Exchangers, Industrial

AEROFIN CORPORATION
101 Greenway Ave.
Syracuse 3, N. Y.
HARRISON RADIATOR DIVISION
GENERAL MOTORS CORPORATION
Lockport, N. Y.

YOUNG RADIATOR COMPANY
709 S. Marquette St.
Racine, Wisconsin

Heat Exchangers, Oil and Water
See also headings under "Coolers"; "Exchangers, Heat"; "Water Cooling Equipment"; etc.
HARRISON RADIATOR DIVISION
GENERAL MOTORS CORPORATION
Lockport, N. Y.
ROME-TURNEY RADIATOR CO.
Canal Street
Rome, New York
UNITED AIRCRAFT PRODUCTS, INC.
1116 Bolander Ave.
Dayton 1, Ohio
WORTHINGTON CORPORATION
421 Worthington Ave.
Harrison, N. J.
YATES-AMERICAN MACHINE CO.
729 Fourth St.
Beloit, Wisconsin
YOUNG RADIATOR COMPANY
709 S. Marquette St.
Racine, Wisconsin

Heaters, Cab & Space
KYSOR HEATER COMPANY
Cadillac, Michigan
YOUNG RADIATOR COMPANY
709 S. Marquette St.
Racine, Wisconsin

Heaters, Space, Portable
CLAYTON MFG. COMPANY
El Monte, California

Honing Fixtures
C. ALLEN FULMER CO.
1251 1st Nat'l Bank Bldg.
Cincinnati 2, Ohio

Honing Machine, Precision
SUNNEN PRODUCTS CO.
7954 Manchester
St. Louis 17, Missouri

Honing Stones
C. ALLEN FULMER COMPANY
1251 1st Nat'l Bank Bldg.
Cincinnati 2, Ohio

Honing Tools
C. ALLEN FULMER COMPANY
1251 1st Nat'l Bank Bldg.
Cincinnati 2, Ohio
SUNNEN PRODUCTS CO.
7954 Manchester
St. Louis 17, Missouri

Horns, Air & Electrical
NATHAN MANUFACTURING CORP.
45-02 Ditmars Blvd.
Long Island City 5, N. Y.

Hose, Flexible Assemblies
ANCHOR COMPANY
Libertyville, Ill.

Hose, Hydraulic Equipment
ANCHOR COMPANY
Libertyville, Ill.

Hose, Hydraulic, High Pressure
ANCHOR COMPANY
Libertyville, Ill.

Hose, Line & Filter
ANCHOR COMPANY
Libertyville, Ill.

Hose, Metal For Steam, Oil, Compressed Air
See also headings under "Flexible Hose" and "Tubing".
THE AMERICAN BRASS CO.
AMERICAN METAL HOSE DIVISION
698 S. Main Street
Waterbury 20, Conn.
ATLANTIC METAL HOSE CO., INC.
309 Dyckman Street
New York 34, New York
SCINTILLA DIVISION
BENDIX AVIATION CORP.
Sidney, New York

Hose, Oil & Gasoline, Etc.
ANCHOR COMPANY
Libertyville, Ill.

Hoses & Hose Assemblies, Non-Metallic
ANCHOR COMPANY
Libertyville, Ill.
RESISTOFLEX CORPORATION
39 Plansoen St.
Belleville, N. J.
THE ANCHOR PACKING COMPANY
401 N. Broad St.
Philadelphia, Pa.
THE WEATHERHEAD COMPANY
FORT WAYNE DIVISION
128 W. Washington Blvd.
Fort Wayne, Ind.

Hoses, Flexible Assemblies
AEROQUIP CORPORATION
300 S. East Ave.
Jackson, Michigan
THE AMERICAN BRASS COMPANY
AMERICAN METAL HOSE DIVISION
698 S. Main St.
Waterbury 20, Connecticut
ANCHOR COMPANY
Libertyville, Ill.
ATLANTIC METAL HOSE CO., INC.
309 Dyckman Street
New York 34, New York
RESISTOFLEX CORPORATION
39 Plansoen St.
Belleville, N. J.
THE WEATHERHEAD COMPANY
FORT WAYNE DIVISION
128 W. Washington Blvd.
Fort Wayne, Ind.

Hoses, Flexible Metallic
ALLIED METAL HOSE COMPANY
37-46 Ninth St.
Long Island City 1, N. Y.
THE AMERICAN BRASS CO.
AMERICAN METAL HOSE DIVISION
698 S. Main Street
Waterbury 20, Conn.
ATLANTIC METAL HOSE CO. INC.
309 Dyckman Street
New York 34, N. Y.
SCINTILLA DIVISION
BENDIX AVIATION CORP.
Sidney, New York

Hoses, Flexible Wire Braid
AEROQUIP CORPORATION
300 South East Avenue
Jackson, Michigan
THE AMERICAN BRASS CO.
AMERICAN METAL HOSE DIVISION
698 South Main Street
Waterbury 20, Connecticut
ATLANTIC METAL HOSE CO. INC.
309 Dyckman Street
New York 34, N. Y.
SCINTILLA DIVISION
BENDIX AVIATION CORP.
Sidney, New York
THE WEATHERHEAD COMPANY
FORT WAYNE DIVISION
128 W. Washington Blvd.
Fort Wayne, Ind.

Hydraulic Fluids
THE PURE OIL CO.
35 E. Wacker Drive
Chicago 1, Ill.
SINCLAIR REFINING COMPANY
600 Fifth Avenue
New York 20, New York

Hydraulic Governor Repair
DIESEL CONTROL CORPORATION
226 N. Marine Ave.
Wilmington, California

Hydraulic Starting Motors
HYDRAMOTIVE, INC.
6723 Denison Ave.
Cleveland 2, Ohio

Hydraulic Torque Converters
ALLISON DIVISION
GENERAL MOTORS CORP.
Post Office Box 894
Indianapolis 6, Indiana

Hydraulic Transmissions
ALLISON DIVISION
GENERAL MOTORS CORP.
P. O. Box 894
Indianapolis 6, Ind.

Ignition Systems, Gas Engine
AMERICAN BOSCH DIVISION
AMERICAN BOSCH ARMA CORP.
3664 Main Street
Springfield 7, Mass.
DELCO-REMY DIVISION
GENERAL MOTORS CORPORATION
2401 Columbus Avenue
Anderson, Indiana
SCINTILLA DIVISION
BENDIX AVIATION CORPORATION
Sidney, New York

Ignition Transformers
AMERICAN BOSCH DIVISION
AMERICAN BOSCH ARMA CORP.
3664 Main Street
Springfield 7, Mass.
SCINTILLA DIVISION
BENDIX AVIATION CORP.
Sidney, New York

Impact Wrenches
CHICAGO-PNEUMATIC TOOL CO.
6 E. 44th St.
New York, N. Y.
INGERSOLL-RAND COMPANY
11 Broadway
New York 4, New York

Indicators, Carbon Dioxide Portable
BACHARACH INDUSTRIAL INSTRUMENT CO.
7301 Penn Avenue
Pittsburgh 8, Pa.

Indicators, Diesel Engine
See also "Compression Testers, Diesel Engine", and other headings under "Indicators".
BACHARACH INDUSTRIAL INSTRUMENT CO.
7301 Penn Avenue
Pittsburgh 8, Pa.
KIENE DIESEL ACCESSORIES, INC.
10352 Pacific Ave.
Franklin Park, Illinois

Indicators, Direct Reading, Maximum Pressure
BACHARACH INDUSTRIAL INSTRUMENT CO.
7301 Penn Ave.
Pittsburgh 8, Pa.

Indicators, Maximum Pressure
BACHARACH INDUSTRIAL INSTRUMENT CO.
7301 Penn Avenue
Pittsburgh 8, Pa.

Indicators, Oxygen, Portable
BACHARACH INDUSTRIAL INSTRUMENT CO.
7301 Penn Avenue
Pittsburgh 8, Pa.

Indicators, Pressure-Time, Diesel Engine
BACHARACH INDUSTRIAL INSTRUMENT CO.
7301 Penn Avenue
Pittsburgh 8, Pa.

Indicators, Speed
See also, "Tachometers".
STEWART-WARNER CORP.
1840 W. Diversey Pkwy.
Chicago, Ill.
O. ZERNICKOW COMPANY
15 Park Row
New York 38, N. Y.

Indicators, Viscosity, Oil
THE GERIN CORPORATION
Avon, N. J.

Induction Heating Equipment
OHIO CRANKSHAFT COMPANY
3800 Harvard Avenue
Cleveland 5, Ohio

Industrial Oils
See also headings under "Lubricants" and "Greases".
ASHLAND OIL & REFINING CO.
1409 Winchester Ave.
Ashland, Kentucky
GULF OIL CORP.
GULF REFINING CO.
1822 Gulf Bldg.
Pittsburgh 30, Pa.
SHELL OIL COMPANY
50 W. 50th St.
New York 20, N. Y.
SINCLAIR REFINING COMPANY
600 Fifth Avenue
New York 20 New York
STANDARD OIL COMPANY OF CALIF.
WESTERN OPERATION DIVISION
225 Bush Street
San Francisco 20, California
STEWART-WARNER CORP.
ALEMITE DIVISION
1840 W. Diversey Pkwy.
Chicago, Ill.

Industrial Wheel Tractors
MINNEAPOLIS-MOLINE
P. O. Box 1050
Minneapolis, Minn.

Ingots and Billets
ALUMINUM COMPANY OF AMERICA
Pittsburgh 19, Pa.
ERIE FORGE & STEEL CORPORATION
16th & Cascade Streets
Erie, Pennsylvania

Injection Systems, Fuel
AMERICAN BOSCH DIVISION
AMERICAN BOSCH ARMA CORP.
3664 Main St.
Springfield 7, Mass.
C.A.V. DIVISION OF LUCAS ELECTRICAL SERVICES, INC.
14820 Detroit Avenue
Cleveland 7, Ohio
HARTFORD MACHINE SCREW CO.
Box 1440
Hartford 2 Conn.
MICRO-PRECISION DIVISION
MICROMATIC HONE CORP.
2205 Lee St.
Evanston, Ill.
SCINTILLA DIVISION
BENDIX AVIATION CORP.
Sidney, N. Y.

Injection Systems, Service
See also "Fuel Injection Systems, Repair & Service"; "Service, Injection System"
INTERSTATE DIESEL SERVICE, INC.
7120 Carnegie Ave.
Cleveland 3, Ohio

Injector Test Stand
See also "Nozzle Testers," "Test Stands".
BACHARACH INDUSTRIAL INSTRUMENT CO.
7301 Penn Avenue
Pittsburgh 8, Pa.

Intake Silencers—Cleaners, Dry Type
See also "Silencers, Intake".
THE FLUOR CORP., LTD.
2500 S. Atlantic Blvd.
Los Angeles 22, Calif.

Iron Plating
See also "Plating".
VAN DER HORST CORP. OF AMERICA
1645 East State Street
Olean, New York

Internal Expanding Wrench
DOUBLE T PRODUCTS CO.
TUBE TULE DIVISION
301 Acacia Ave.
Hawthorne, Calif.

Lapping Blocks
BACHARACH INDUSTRIAL INSTRUMENT CO.
7301 Penn Avenue
Pittsburgh 8, Pa.

Lapping Equipment, Power & Hand
DIESEL CONTROL CORPORATION
226 N. Marine Ave.
Wilmington, Calif.

Line Boring Machines
CEDAR RAPIDS ENGINEERING CO.
902 17th St. N.E.
Cedar Rapids, Iowa

Lock Nuts
COLUMBIA NUT & BOLT CO., INC.
945 Main Street
Bridgeport 3, Connecticut

Locomotives, Diesel
See also "Diesel Locomotives"
GENERAL ELECTRIC COMPANY
Schenectady 5, N. Y.
FAIRBANKS, MORSE & CO.
600 So. Michigan Ave.
Chicago 5, Illinois

Locomotives, Diesel-Electric
GENERAL ELECTRIC COMPANY
Schenectady 5, N. Y.
ELECTRO-MOTIVE DIVISION
GENERAL MOTORS CORPORATION
LaGrange, Illinois

Locomotives, Diesel-Hydraulic
GENERAL ELECTRIC COMPANY
Schenectady 5, N. Y.

Locomotives, Diesel-Mechanical
GENERAL ELECTRIC COMPANY
Schenectady 5, N. Y.

Locomotives, Diesel, Mine
GENERAL ELECTRIC COMPANY
Schenectady 5, N. Y.

Lubricants
See also "Industrial Oils", "Greases" and "Automotive Greases"
ASHLAND OIL & REFINING CO.
1409 Winchester Ave.
Ashland, Kentucky
GULF OIL CORP.
GULF REFINING COMPANY
1822 Gulf Building
Pittsburgh 30 Pa.
PURE OIL COMPANY
35 East Wacker Drive
Chicago 1, Illinois
SINCLAIR REFINING COMPANY
600 Fifth Avenue
New York 20, N. Y.
STEWART-WARNER CORP.
ALEMITE DIVISION
1840 W. Diversey Pkwy.
Chicago, Ill.
THE TEXAS COMPANY
135 East 42 Street
New York 17, New York

Lubricating Compounds
CITIES SERVICE OIL COMPANY
70 Pine Street
New York, New York
MANZEL
315 Babcock Street
Buffalo 10, New York
THE PURE OIL CO.
35 E. Wacker Drive
Chicago 1, Ill.

Lubricating Oils
See also "Automotive Lubricating Oils"; "Oils Lubricating" and "Cylinder Oils".
ASHLAND OIL & REFINING CO.
1409 Winchester Ave.
Ashland, Kentucky
CITIES SERVICE OIL COMPANY
70 Pine Street
New York, New York
GULF OIL CORP.
GULF REFINING COMPANY
1822 Gulf Building
Pittsburgh 30, Pa.
MACMILLAN PETROLEUM CORP.
530 W. Sixth St.
Los Angeles 14, Calif.
PURE OIL COMPANY
35 East Wacker Drive
Chicago 1, Illinois
SHELL OIL COMPANY
50 West 50th St.
New York 20, N. Y.
SINCLAIR REFINING CO.
600 Fifth Ave.
New York 20, N. Y.
STANDARD OIL CO. OF CALIFORNIA
WESTERN OPERATION DIVISION
225 Bush Street
San Francisco 20, Calif.
STANDARD OIL CO. (INDIANA)
910 South Michigan Ave.
Chicago, Illinois
STEWART-WARNER CORP.
ALEMITE DIVISION
1840 W. Diversey Pkwy.
Chicago, Ill.

Lubricators, Felt Wick
WM. W. NUGENT & CO., INC.
410-412 N. Hermitage Ave.
Chicago 22, Ill.

Lubricators, Force Feed
MANZEL
315 Babcock Street
Buffalo 10, New York

Lubricators, Fresh Oil
MANZEL
315 Babcock Street
Buffalo 10, New York

Lubricators, Mechanical
MANZEL
315 Babcock Street
Buffalo 10, New York
NATHAN MANUFACTURING CORP.
45-02 Ditmars Blvd.
Long Island City 5, N. Y.
STEWART-WARNER CORP.
ALEMITE DIVISION
1840 W. Diversey Pkwy.
Chicago, Ill.

Lubricators, Multiple Feed
MANZEL
315 Babcock Street
Buffalo 10, New York

Lubricators, Sight Feed
MANZEL
315 Babcock Street
Buffalo 10, New York

Machine Tools
HALL-TOLEDO DIVISION
BAKER BROS., INC.
138-142 Sylvania Ave.
Toledo 12, Ohio

Machine Tools, Precision
HALL-TOLEDO DIVISION
BAKER BROS., INC.
138-142 Sylvania Ave.
Toledo 12, Ohio

Machine Tools, Precision Honing
C. ALLEN FULMER CO.
1251 1st Nat'l Bank Bldg.
Cincinnati 2, Ohio

Magnetos, High Tension
AMERICAN BOSCH DIVISION
AMERICAN BOSCH ARMA CORP.
3664 Main Street
Springfield, Mass.
SCINTILLA DIVISION
BENDIX AVIATION CORPORATION
Sidney, New York

Magnetos, Low Tension
AMERICAN BOSCH DIVISION
AMERICAN BOSCH ARMA CORP.
3664 Main Street
Springfield, Mass.
SCINTILLA DIVISION
BENDIX AVIATION CORPORATION
Sidney, New York

Manometers
BACHARACH INDUSTRIAL
INSTRUMENT CO.
7301 Penn Ave.
Pittsburgh 8, Pa.

Marine Diesel, Front Gear-Driven Accessories
FAIRBANKS MORSE & CO.
600 So. Michigan Ave.
Chicago 5, Illinois

Marine Reduction Gears
BRAD FOOTE GEAR WORKS
1315 S. Cicero Ave.
Cicero 50, Ill.

Marine Reverse & Reduction Gears
ALLISON DIVISION
GENERAL MOTORS CORP.
P. O. Box 894
Indianapolis 6, Indiana
BRAD FOOTE GEAR WORKS
1315 S. Cicero Ave.
Cicero 50, Ill.
DELAVAL STEAM TURBINE CO.
Trenton 2, N. J.
THE SNOW-NABSTEDT GEAR CORP.
251 Welton St.
Hamden, Conn.

Meters, Electrical Indicating
See also "Ammeters"
ROCHESTER MFG. CO., INC.
9 Rockwood Place
Rochester 10, N. Y.

Motor Fuels
See also "Automotive Diesel Fuel"; "Diesel Fuel Oil"; "Fuel Oil, Diesel"; "Oil, Diesel Fuel".
ASHLAND OIL & REFINING CO.
1409 Winchester Avenue
Ashland, Kentucky
CITIES SERVICE OIL CO.
70 Pine Street
New York, N. Y.
STANDARD OIL CO. OF CALIF.
WESTERN OPERATION DIVISION
225 Bush Street
San Francisco, California

Motor Generator Sets—Electro Plating, Low Voltage
COLUMBIA ELECTRIC MFG. CO.
4519 Hamilton Avenue
Cleveland 14, Ohio
KATO ENGINEERING CO.
1415 First Ave.
Mankato, Minnesota

Motors, Electric, A. C.
ELECTRIC MACHINERY MFG. CO.
800 Central Avenue
Minneapolis 13, Minn.

Motors, Electric, A. C. & D. C.
ELLIOTT COMPANY
Jeannette, Pennsylvania
THE IDEAL ELECTRIC & MFG. CO.
First & Oak St.
Mansfield, Ohio
LOUIS ALLIS COMPANY
427 E. Stewart St.
Milwaukee 7, Wisconsin
RELIANCE ELECTRIC & ENGINEERING COMPANY
1088 Ivanhoe Road
Cleveland 10, Ohio

Motors, Gear
See also, "Gearmotors".
BRAD FOOTE GEAR WORKS
1315 S. Cicero Ave.
Cicero 50, Ill.
RELIANCE ELECTRIC & ENGINEERING CO.
1088 Ivanhoe Road
Cleveland 10, Ohio

Mountings (Engine), Vibration Absorbing
THE KORFUND CO., INC.
48-19 32nd Place
Long Island City, N. Y.

Mufflers, Intake & Exhaust
See also headings under "Silencers".
BURGESS-MANNING COMPANY
742 E. Park Ave.
Libertyville, Illinois
DONALDSON COMPANY, INC.
666 Pelham Boulevard
St. Paul 14, Minn.
THE FLUOR CORP., LTD.
2500 S. Atlantic Blvd.
Los Angeles 22, Calif.
KITTELL MUFFLER & ENGINEERING CO.
915 South Santa Fe Avenue
Los Angeles, California

Mufflers, Spark Arresting
BURGESS-MANNING COMPANY
742 E. Park Ave.
Libertyville Illinois
THE FLUOR CORP., LTD.
2500 S. Atlantic Blvd.
Los Angeles 22, Calif.
KITTELL MUFFLER & ENGINEERING CO.
915 South Santa Fe Avenue
Los Angeles, California

Nozzle Cleaning Tools
See also, "Test Stands".
BACHARACH INDUSTRIAL INSTRUMENT COMPANY
7301 Penn Avenue
Pittsburgh 8, Pa.

Nozzle Testers
See also "Injector Test Stand".
AMERICAN BOSCH DIVISION
AMERICAN BOSCH ARMA CORP.
3664 Main Street
Springfield, Massachuetts
BACHARACH INDUSTRIAL INSTRUMENT CO.
7301 Penn Ave.
Pittsburgh 8, Pa.
BUDA DIVISION
ALLIS-CHALMERS MFG. CO.
154th & Commercial Ave.
Harvey, Ill.
C. A. V. DIVISION OF LUCAS ELECTRICAL SERVICES, INC.
14820 Detroit Avenue
Cleveland 7, Ohio
KIENE DIESEL ACCESSORIES, INC.
10352 Pacific Avenue
Franklin Park, Illinois

Nozzles, Spray, Water Cooled
AMERICAN BOSCH DIVISION
AMERICAN BOSCH ARMA CORP.
3664 Main Street
Springfield 7, Mass.
SCINTILLA DIVISION
BENDIX AVIATION CORPORATION
Sidney, New York

Nuts, Lock
COLUMBIA NUT & BOLT CO., INC.
945 Main Street
Bridgeport 3, Connecticut
HARTFORD MACHINE SCREW CO.
Box 1440
Hartford 2, Conn.

Nuts, Plain & Castle
HARTFORD MACHINE SCREW CO.
P. O. Box 1440
Hartford 2, Connecticut

"O" Rings, Metallic
UNITED AIRCRAFT PRODUCTS, INC.
1116 Bolander Ave.
Dayton 1, Ohio

Oil Conditioners
See also headings under "Centrifuges"; "Conditioners".
THE HILLIARD CORP.
120 West 4th St.
Elmira, New York
HOUDAILLE-HERSHEY OF INDIANA, INC.
415 Indianapolis Ave.
Lebanon, Indiana
WINSLOW ENGINEERING CO.
4069 Hollis St.
Oakland, Calif.

Oil Conditioning Systems
DULUTH FILTER COMPANY
2911 W. Superior St.
Duluth 3, Minn.
WM. W. NUGENT & CO., INC.
410-12 N. Hermitage Ave.
Chicago 22, Ill.

Oil Purification Systems, Filtering Earth Type
THE BRIGGS FILTRATION COMPANY
River Road
Washington 16, D. C.
THE HILLIARD CORP.
120 W. Fourth St.
Elmira, N. Y.
HOUDAILLE-HERSHEY OF INDIANA, INC.
415 Indianapolis Ave.
Lebanon, Indiana
LUBER-FINER, INC.
2514 South Grand
Los Angeles 7, California
U. S. HOFFMAN MACHINERY CORP.
105 Fourth Ave.
New York 3, N. Y.

Oil Purification Systems Pressure and Gravity Types
THE BRIGGS FILTRATION COMPANY
River Road
Washington 16, D.C.
THE HILLIARD CORP.
120 W. 4th Street
Elmira, New York

LUBER-FINER INC.
2514 South Grand
Los Angeles 7, Calif.
WILLIAM W. NUGENT & CO., INC.
410-412 N. Hermitage Avenue
Chicago 22, Illinois
U. S. HOFFMAN MACHINERY CORP.
105 Fourth Ave.
New York 3, N. Y.

Oil Purifiers, Centrifugal

THE DE LAVAL SEPARATOR CO.
The De Laval Bldg.
Poughkeepsie, N. Y.

Oil Reclamation Systems

THE HILLIARD CORPORATION
120 West Fourth Street
Elmira, New York
WM. W. NUGENT & COMPANY, INC.
410-412 North Hermitage Avenue
Chicago 22, Illinois

Oil Seals & Grease Retainers

THE FITZGERALD MFG. CO.
Torrington, Conn.
VICTOR MFG. & GASKET CO.
5750 W. Roosevelt Blvd.
Chicago, Illinois

Oil Separators

See also "Centrifuges"

AIR MAZE CORPORATION
25000 Miles Road
Cleveland 28, Ohio
CENTRICO, INC.
75 West Forest Avenue
Englewood, New Jersey
THE DE LAVAL SEPARATOR COMPANY
Poughkeepsie, New York

Oil Systems, Pressure & Gravity

WM. W. NUGENT & CO., INC.
410-12 N. Hermitage Ave.
Chicago 22, Ill.

Oil Systems, Pressure & Gravity Type

WM. W. NUGENT & CO., INC.
410-12 N. Hermitage Ave.
Chicago 22, Ill.

Oil Testing Equipment

THE GERIN CORPORATION
Avon, N. J.

Oils, Diesel Fuel

See also "Automotive Diesel Fuel"; "Diesel Fuel Oil"; "Fuel Oil, Diesel"; "Motor Fuels".

ASHLAND OIL & REFINING CO.
1409 Winchester Avenue
Ashland, Kentucky
GULF OIL CORPORATION
GULF REFINING COMPANY
1822 Gulf Building
Pittsburgh 30, Pa.
PURE OIL COMPANY
35 East Wacker Drive
Chicago 1, Illinois
SHELL OIL COMPANY
50 West 50th St.
New York 20, N. Y.
SINCLAIR REFINING CO.
600 Fifth Avenue
New York 20, New York
THE TEXAS COMPANY
135 East 42 Street
New York 17, New York

Packaged Generators

CHICAGO-PNEUMATIC TOOL CO.
6 East 44th St.
New York, New York
ENTERPRISE ENGINE & MACHINERY CO.
18th & Florida Streets
San Francisco, California
CLAYTON MANUFACTURING CO.
El Monte, Calif.

Packing, Lead, Shredded

THE ANCHOR PACKING CO.
401 N. Broad St.
Philadelphia 8, Pa.

Packing, Oil Wiper

THE ANCHOR PACKING CO.
401 N. Broad St.
Philadelphia 8, Pa.
C. LEE COOK MFG. CO.
916 South 8 St.
Louisville 3, Kentucky
DOUBLE SEAL RING COMPANY
2065 Montgomery
Fort Worth, Texas

Packing, Rod Metallic

THE ANCHOR PACKING CO.
401 N. Broad St.
Philadelphia 8, Pa.
C. LEE COOK MFG. CO.
916 South 8 St.
Louisville 3, Kentucky
DAROS AMERICAN CORP.
8128 N. Lawndale Ave.
Skokie, Ill.
DOUBLE SEAL RING COMPANY
2065 Montgomery
Fort Worth, Texas

Packing Sheets

THE ANCHOR PACKING CO.
401 N. Broad St.
Philadelphia 8, Pa.
VICTOR MFG. & GASKET CO.
5750 W. Roosevelt Blvd.
Chicago, Illinois

Packing, Sheets, Oil & Water

THE ANCHOR PACKING COMPANY
401 N. Broad St.
Philadelphia, Pa.
VICTOR MFG. & GASKET CO.
5750 W. Roosevelt Blvd.
Chicago, Illinois

Pile Hammers, Diesel

SYNTRON COMPANY
1000 Lexington Ave.
Homer City, Pa.

Pillow Blocks, Babbitted & Bronze-Bushed Bearings

DODGE MANUFACTURING CORP.
Mishawaka, Indiana

Pillow Blocks, Ball & Roller Bearings

DODGE MANUFACTURING CORP.
Mishawaka, Indiana

Pinions

BRAD FOOTE GEAR WORKS
1315 S. Cicero Ave.
Cicero 50, Ill.

Pipe Fittings, Compression

See also "Fittings".

THE WEATHERHEAD COMPANY
FORT WAYNE DIVISION
128 W. Washington Blvd.
Fort Wayne, Ind.

Piston Groove Wear Ring Inserts

DAROS AMERICAN CORP.
8128 N. Lawndale Ave.
Skokie, Ill.

Piston Pin Bushing Borer

VAN NORMAN COMPANY
3640 Main Street
Springfield, Massachusetts

Piston Pin Bushing Hones

SUNNEN PRODUCTS CO.
7954 Manchester
St. Louis 17, Missouri

Piston Pins

THE MARQUETTE METAL PRODUCTS CO.
1145 Galewood Drive
Cleveland 10, Ohio
SEALED POWER CORPORATION
2001 Sanford St.
Muskegon 61, Michigan

Piston Ring Pot Castings

KOPPERS COMPANY, INC.
P. O. Box 298
Baltimore 3, Maryland

Piston Rings

C. LEE COOK MFG. CO.
916 South 8 St.
Louisville 3, Kentucky
DAROS AMERICAN CORP.
8128 N. Lawndale Ave.
Skokie, Ill.
DOUBLE SEAL RING COMPANY
2065 Montgomery Street
Fort Worth, Texas
KOPPERS CO., INC.
P.O. Box 298
Baltimore 3, Maryland
SEALED POWER CORP.
2001 Sanford Street
Muskegon 61, Michigan
WILKENING MANUFACTURING CO.
2000 South 71 Street
Philadelphia 42, Pennsylvania

Piston Rings, Anti-Corrosive Iron

DAROS AMERICAN CORP.
8128 N. Lawndale Ave.
Skokie, Ill.

Piston Rings, Oil Control

C. LEE COOK MANUFACTURING CO.
916 South 8 St.
Louisville 3, Kentucky
DAROS AMERICAN CORP.
8128 N. Lawndale Ave.
Skokie, Ill.
DOUBLE SEAL RING COMPANY
2065 Montgomery Street
Fort Worth, Texas
KOPPERS COMPANY, INC.
P. O. Box 298
Baltimore 3, Maryland
SEALED POWER CORPORATION
2001 Sanford Street
Muskegon 61, Michigan
WILKENING MANUFACTURING CO.
2000 South 71 Street
Philadelphia 42, Pennsylvania

Piston Rings, Sealing

C. LEE COOK MFG. CO.
916 South 8 St.
Louisville 3, Kentucky
DAROS AMERICAN CORP.
8128 N. Lawndale Ave.
Skokie, Ill.
DOUBLE SEAL RING CO.
2065 Montgomery Street
Fort Worth, Texas
KOPPERS CO. INC.
P.O. Box 298
Baltimore 3, Maryland
SEALED POWER CORPORATION
2001 Sanford Street
Muskegon 61, Michigan

Pistons
GILLETT & EATON, INC.
846 Doughty Street
Lake City, Minnesota
THE OHIO PISTON COMPANY
5340 Hamilton Avenue
Cleveland 14, Ohio
SEALED POWER CORPORATION
2001 Sanford Street
Muskegon 61, Michigan
UNITED ENGINE & MACHINE CO.
310 Preda St.
San Leandro, Calif.
ZOLLNER MACHINE WORKS
Beuter Road
Fort Wayne, Indiana

Pistons, Aluminum Alloy
GILLETT & EATON, INC.
846 Doughty St.
Lake City, Minnesota
THE OHIO PISTON COMPANY
5340 Hamilton Avenue
Cleveland 14, Ohio
SEALED POWER CORP.
2001 Sanford Street
Muskegon 61, Michigan
UNITED ENGINE & MACHINE CO.
310 Preda St.
San Leandro, Calif.
ZOLLNER MACHINE WORKS
Beuter Road
Fort Wayne, Indiana

Pistons, Aluminum Alloy, Repaired
RALPH STARK, INC.
43-12 32nd St.
Long Island City 1, New York

Pistons, Bi-Metallic
UNITED ENGINE & MACHINE CO.
310 Preda St.
San Leandro, Calif.

Pistons, Cast Iron
GILLETT & EATON, INC.
846 Doughty St.
Lake City, Minnesota
THE OHIO PISTON COMPANY
5340 Hamilton Avenue
Cleveland 14, Ohio
SEALED POWER CORPORATION
2001 Sanford Street
Muskegon 61, Michigan

Pistons, Cracks Repaired
METALOCK REPAIR SERVICE, INC.
36-15 48 Ave.
Long Island City 1, N. Y.

Pistons, Diesel Engine
GILLETT & EATON, INC.
846 Doughty Street
Lake City, Minnesota
ZOLLNER MACHINE WORKS
Beuter Road
Fort Wayne, Indiana

Pistons, Heavy Duty
ZOLLNER MACHINE WORKS
Beuter Road
Fort Wayne, Indiana

Plating, Chrome
See also "Chrome"
KOPPERS COMPANY, INC.
P. O. Box 298
Baltimore 3, Maryland
CHROMIUM CORP. OF AMERICA
1760 Lakeview Road
Cleveland 12, Ohio
VAN DER HORST CORP. OF AMERICA
1645 West State Street
Olean, New York

Plating, Iron
VAN DER HORST CORP. OF AMERICA
1645 West State Street
Olean, New York

Pneumatic Tools
See also "Air Tools".
CHICAGO PNEUMATIC TOOL CO.
6 East 44 Street
New York, New York

Portable Power Units
See also "Packaged Generators".
BUDA DIVISION
ALLIS-CHALMERS MFG. CO.
154th & Commercial Ave.
Harvey, Ill.
BURMEISTER & WAIN AMERICAN CORP.
17 Battery Place
New York 4, New York
ENTERPRISE ENGINE & MACHINERY CO.
18th & Florida Streets
San Francisco, California
FAIRBANKS, MORSE & CO.
600 So. Michigan Ave.
Chicago 5, Illinois
HALLETT MANUFACTURING CO.
1601 W. Florence Ave.
Inglewood, Calif.
MINNEAPOLIS-MOLINE
P. O. Box 1050
Minneapolis, Minn.
WAUKESHA MOTOR COMPANY
St. Paul Ave.
Waukesha, Wisconsin

Porus Chrome Plating
VAN DER HORST CORP. OF AMERICA
1645 East State Street
Olean, New York

Power Plants, Automatically Controlled
CONSOLIDATED DIESEL ELECTRIC CORP.
GENERATOR SET DIVISION
Ludlow & Canal Sts.
Stamford, Conn.
ENTERPRISE ENGINE & MACHINERY CO.
18th & Florida Streets
San Francisco, California
FAIRBANKS, MORSE & CO.
600 So. Michigan Ave.
Chicago 5, Illinois

Power Take-Off Units
COTTA TRANSMISSION COMPANY
2340 11th St.
Rockford, Ill.
ROCKFORD CLUTCH DIVISION
BORG-WARNER CORPORATION
1301 18th Avenue
Rockford, Ill.
THE SNOW-NABSTEDT GEAR CORP.
251 Welton St.
Hamden, Conn.
TWIN DISC CLUTCH CO.
Racine, Wisconsin

Power Units
AMERICAN M-A-N CORP.
149 Broadway
New York 6, N. Y.
BUDA DIVISION
ALLIS-CHALMERS MFG. CO.
154th & Commercial Ave.
Harvey, Ill.
HERCULES MOTOR CORP.
101 11th St., S.E.
Canton 2, Ohio
MINNEAPOLIS-MOLINE
P. O. Box 1050
Minneapolis 1, Minn.
R. H. SHEPPARD CO., INC.
Hanover, Pennsylvania
WAUKESHA MOTOR COMPANY
St. Paul Ave.
Waukesha, Wisconsin

Pressuregraph
ELECTRO PRODUCTS LABORATORIES
4501 N. Ravenswood Ave.
Chicago 40, Ill.

Pressure Switches
AMOT CONTROLS CORP.
P. O. Box 1707
Richmond 1, Calif.
COLE-HERSEE COMPANY
20 Old Colony Ave.
Boston 27, Mass.

Pullers, Gear, Bushing, Wheel, Bearing
SNAP-ON TOOLS CORP.
8064 28th Avenue
Kenosha, Wisconsin

Pump Calibrating Test Stands
BACHARACH INDUSTRIAL INSTRUMENT CO.
7301 Penn Avenue
Pittsburgh 8, Pennsylvania

Pumping Units, Diesel
See also "Diesel Pumping Units".
BURMEISTER & WAIN AMERICAN CORP.
17 Battery Place
New York 4, N. Y.
ENTERPRISE ENGINE & MACHINERY CO.
18th & Florida Streets
San Francisco, California
DELAVAL STEAM TURBINE CO.
Trenton 2, N. J.
WHITE DIESEL ENGINE DIVISION
THE WHITE MOTOR CO.
1401 Sheridan Ave.
Springfield, Ohio

Pumps, Automatic Reversing
TUTHILL PUMP CO.
939 E. 95th St.
Chicago 19, Ill.
VIKING PUMP CO.
4th & Jorgensen Streets
Cedar Falls, Iowa

Pumps, Centrifugal
DELAVAL STEAM TURBINE CO.
Trenton 2, N. J.
WARREN STEAM PUMP CO., INC.
C1 Bridges Ave.
Warren, Mass.
WORTHINGTON CORPORATION
421 Worthington Ave.
Harrison, N. J.

Pumps, Cooling Water
SCHWITZER-CUMMINS CO.
1125 Massachusetts Ave.
Indianapolis, Ind.
WARREN STEAM PUMP CO., INC.
C1 Bridges Ave.
Warren, Mass.

Pumps, Fuel Oil Injection
See also "Injection Equipment", etc.
AMERICAN BOSCH DIVISION
AMERICAN BOSCH ARMA CORP.
3664 Main St.
Springfield 7, Mass.
C. A. V. DIVISION OF LUCAS ELECTRICAL SERVICES, INC.
14820 Detroit Avenue
Cleveland 7, Ohio
DELAVAL STEAM TURBINE CO.
Trenton 2, N. J.
HARTFORD MACHINE SCREW CO.
Box 1440
Hartford 2, Connecticut
MICRO-PRECISION DIVISION
MICROMATIC HONE CORP.
2205 Lee Street
Evanston, Illinois
SCINTILLA DIV.
BENDIX AVIATION CORP.
Sidney, N. Y.
WARREN STEAM PUMP CO., INC.
C1 Bridges Ave.
Warren, Mass.

Pumps, Fuel Transfer

C.A.V. DIVISION
LUCAS ELECTRICAL SERVICES, INC.
14820 Detroit Ave.
Cleveland 7, Ohio

DELAVAL STEAM TURBINE CO.
Trenton 2, N. J.

ECLIPSE MACHINE DIVISION
BENDIX AVIATION CORPORATION
Elmira, New York

HARTFORD MACHINE SCREW CO.
Box 1440
Hartford 2, Conn.

TUTHILL PUMP CO.
939 E. 95th St.
Chicago 19, Ill.

VIKING PUMP CO.
4th & Jorgensen Streets
Cedar Falls, Iowa

WARREN STEAM PUMP CO., INC.
Cl Bridges Ave.
Warren, Mass.

Pumps, Hydraulic

DELAVAL STEAM TURBINE CO.
Trenton 2, N. J.

TUTHILL PUMP CO.
939 East 95th Street
Chicago 19, Illinois

VIKING PUMP CO.
4th & Jorgensen Streets
Cedar Falls, Iowa

Pumps, Hydraulic Controls

TUTHILL PUMP CO.
939 E. 95th St.
Chicago 19, Ill.

Pumps, Lubricating Oil

DELAVAL STEAM TURBINE CO.
Trenton 2, N. J.

THE MARQUETTE METAL PRODUCTS CO.
1145 Galewood Drive
Cleveland 10, Ohio

TUTHILL PUMP CO.
939 E. 95th St.
Chicago 19, Ill.

VIKING PUMP CO.
4th & Jorgensen Streets
Cedar Falls, Iowa

WARREN STEAM PUMP CO., INC.
Cl Bridges Ave.
Warren, Mass.

THE WAYNE PUMP CO.
Fort Wayne, Indiana

Pumps, Oil

DELAVAL STEAM TURBINE CO.
Trenton 2, N. J.

THE MARQUETTE METAL PRODUCTS CO.
1145 Galewood Drive
Cleveland 10, Ohio

SCHWITZER-CUMMINS CO.
1125 Massachusetts Avenue
Indianapolis, Indiana

TUTHILL PUMP CO.
939 East 95th Street
Chicago 19, Illinois

VIKING PUMP CO.
4th & Jorgensen Streets
Cedar Falls, Iowa

THE WAYNE PUMP CO.
Fort Wayne, Indiana

Pumps, Rotary Gear Type

TUTHILL PUMP CO.
939 E. 95th St.
Chicago 19, Ill.

VIKING PUMP CO.
4th & Jorgensen Streets
Cedar Falls, Iowa

WARREN STEAM PUMP CO., INC.
Cl Bridges Ave.
Warren, Mass.

THE WAYNE PUMP CO.
Fort Wayne, Indiana

Pumps, Rotary, Hand-Driven

THE WAYNE PUMP CO.
Fort Wayne, Indiana

Pumps, Rotary, Screw Type

DELAVAL STEAM TURBINE CO.
Trenton 2, N. J.

WARREN STEAM PUMP CO., INC.
Cl Bridges Ave.
Warren, Mass.

Pumps, Rotary, Vane-type

CHICAGO PNEUMATIC TOOL CO.
6 E. 44 St.
New York, N. Y.

THE MARQUETTE METAL PRODUCTS CO.
1145 Galewood Drive
Cleveland 10, Ohio

Pumps, Stripped Models

TUTHILL PUMP CO.
939 E. 95th St.
Chicago 19, Ill.

VIKING PUMP CO.
4th & Jorgensen Streets
Cedar Falls, Iowa

Pumps, Vacuum

CHICAGO PNEUMATIC TOOL CO.
6 E. 44 St.
New York, N. Y.

MIEHLE-DEXTER SUPERCHARGER DIVISION
DEXTER FOLDER COMPANY
100 Fourth Street
Racine, Wisconsin

Purifiers, Fuel Oil

See also "Reclaimers, Oil"; and headings under "Oil".

CENTRICO, INC.
75 West Forest Avenue
Englewood, New Jersey

THE DE LAVAL SEPARATOR CO.
The De Laval Bldg.
Poughkeepsie, N. Y.

THE HILLIARD CORP.
120 West 4th St.
Elmira, N. Y.

WILLIAM W. NUGENT & CO., INC.
410-412 N. Hermitage Avenue
Chicago 22, Illinois

Purifiers, Industrial Oil

See Heading Above.

CENTRICO, INC.
75 West Forest Avenue
Englewood, New Jersey

THE DE LAVAL SEPARATOR CO.
The De Laval Bldg.
Poughkeepsie, N. Y.

THE HILLIARD CORP.
120 W. 4th Street
Elmira, New York

WILLIAM W. NUGENT & CO., INC.
410-412 N. Hermitage Avenue
Chicago 22, Illinois

THE SHARPLES CORPORATION
2300 Westmoreland Street
Philadelphia 40, Pennsylvania

Purifiers, Lubricating Oil

See also "Reclaimers, Oil"; and headings under "Oil".

CENTRICO, INC.
75 West Forest Avenue
Englewood, New Jersey

THE DE LAVAL SEPARATOR CO.
The De Laval Bldg.
Poughkeepsie, N. Y.

THE HILLIARD CORP.
120 West 4th Street
Elmira, N. Y.

WILLIAM W. NUGENT & CO., INC.
410-412 N. Hermitage Avenue
Chicago 22, Illinois

THE SHARPLES CORPORATION
2300 Westmoreland Street
Philadelphia 40, Pennsylvania

U. S. HOFFMAN MACHINERY CORP.
105 Fourth Ave.
New York 3, N. Y.

Purifiers, Oil

See heading above.

CENTRICO, INC.
75 West Forest Avenue
Englewood, New Jersey

THE DE LAVAL SEPARATOR CO.
The De Laval Bldg.
Poughkeepsie, N. Y.

THE HILLIARD CORP.
120 West Fourth St.
Elmira, New York

WILLIAM W. NUGENT & CO., INC.
410-412 N. Hermitage Avenue
Chicago 22, Illinois

THE SHARPLES CORPORATION
2300 Westmoreland Street
Philadelphia 40 Pennsylvania

U. S. HOFFMAN MACHINERY CORP.
105 Fourth Ave.
New York 3, N. Y.

Push Rods

THE CHICAGO SCREW CO.
2701 Washington Blvd.
Bellwood, Ill.

Pyrometers, Exhaust

ILLINOIS TESTING LABORATORIES, INC.
420 N. LaSalle St.
Chicago 10, Ill.

Pyrometers, Portable

ILLINOIS TESTING LABORATORIES, INC.
420 N. LaSalle St.
Chicago 10, Ill.

Racks, Gear

BRAD FOOTE GEAR WORKS
1315 S. Cicero Ave.
Cicero 50, Ill.

Radiators, Engine Cooling

HARRISON RADIATOR DIV.
GENERAL MOTORS CORP.
Washburn Street
Lockport Ill.

ROME TURNEY RADIATOR CO.
Rome, N. Y.

YATES-AMERICAN MACHINE CO.
729 Fourth St.
Beloit, Wisconsin

YOUNG RADIATOR COMPANY
707 S. Marquette St.
Racine, Wisconsin

Rail Car Engines

STERLING ENGINE CO.
Menominee, Michigan

Reclaimers, Oil

See also headings under "Purifiers" and "Oil".

THE HILLIARD CORP.
120 West 4th St.
Elmira, N. Y.

Recorders, Temperature

BACHARACH INDUSTRIAL INSTRUMENT CO.
7301 Penn Ave.
Pittsburgh 8, Pa.

Rectifiers, Battery Charging

GOOD-ALL ELECTRIC MFG. CO.
Good-All Bldg.
Ogallala, Nebraska

Rectifiers, Cathodic Protection
GOOD-ALL ELECTRIC MFG. CO.
Good-All Building
Ogallala, Neb.

Rectifiers, DC Power Supply
GOOD-ALL ELECTRIC MFG. CO.
Good-All Building
Ogallala, Neb.

Reducers, Speed
BRAD FOOTE GEAR WORKS
1315 S. Cicero Ave.
Cicero 50, Ill.

Regulators, Current & Voltage
See also headings under "Voltage".
DELCO-REMY DIVISION
GENERAL MOTORS CORP.
2401 Columbus Ave.
Anderson, Indiana
THE LEECE-NEVILLE CO.
5109 Hamilton Avenue
Cleveland 14, Ohio

Regulators, Generator Voltage
AMERICAN BOSCH DIVISION
AMERICAN BOSCH ARMA CORP.
3664 Main Street
Springfield, Massachusetts
BROWN BOVERI CORP.
19 Rector St.
New York 6, N. Y.
ELECTRIC MACHINERY MFG. CO.
800 Central Ave.
Minneapolis 13, Minn.
LEECE-NEVILLE COMPANY
5109 Hamilton Avenue
Cleveland 14, Ohio

Regulators, Temperature
AMOT CONTROLS CORP.
P. O. Box 1707
Richmond 1, Calif.
DETROIT CONTROLS CORP.
5900 Trumbull Avenue
Detroit 8, Michigan
FULTON-SYLPHON DIVISION
ROBERTSHAW-FULTON CONTROLS CO.
P. O. Box 400
Knoxville 4, Tennessee
THE POWERS REGULATOR CO.
3400 Oakton Street
Skokie, Illinois

Relays
AUTOMATIC SWITCH CO.
391 Lakeside Ave.
Orange, New Jersey

Repairs, Diesel
See also "Diesel Repairs"; "Diesel Engines Reconditioned".
ARTHUR TICKLE ENGINEERING WORKS, INC.
21 Delevan St.
Brooklyn 31, N. Y.

Rotary Pumps
THE WAYNE PUMP COMPANY
Ft. Wayne 4, Ind.
WORTHINGTON CORPORATION
421 Worthington Ave.
Harrison, New Jersey

Rust Preventives
See also "Anti-Rust Compounds"
ASHLAND OIL & REFINING CO.
1409 Winchester Ave.
Ashland, Ky.
OAKITE PRODUCTS, INC.
19 Rector Street
New York 6, N. Y.
SHELL OIL COMPANY
50 W. 50th St.
New York 20, N. Y.
SINCLAIR REFINING CO.
600 Fifth Avenue
New York 20, N. Y.
STANDARD OIL COMPANY OF CALIF.
WESTERN OPERATION DIVISION
225 Bush Street
San Francisco 20, California
YOUNG RADIATOR COMPANY
709 S. Marquette St.
Racine, Wisc.

Rust Removers
OAKITE PRODUCTS, INC.
19 Rector Street
New York 6, N. Y.

Safety Controls, Engine
See also "Controls, Engine Safety"
AMOT CONTROLS CORP.
P. O. Box 1707
Richmond 1, California
DETROIT CONTROLS CORP.
5900 Trumbull Avenue
Detroit 8, Michigan
COLE-HERSEE COMPANY
20 Old Colony Ave.
Boston 27, Mass.
ILLINOIS TESTING LABS., INC.
420 N. LaSalle St.
Chicago 10, Ill.
PENN CONTROLS, INC.
Goshen, Indiana
POWERS REGULATOR COMPANY
3400 Oakton
Skokie, Illinois

Scale Removal
OAKITE PRODUCTS, INC.
19 Rector Street
New York 6, N. Y.

Schools, Diesel Mechanic
UTILITIES ENGINEERING INSTITUTE
2525 N. Sheffield Ave.
Chicago 14, Ill.

Screw Machine Parts
THE CHICAGO SCREW COMPANY
2701 Washington Blvd.
Bellwood, Ill.

Screw Machine Products
ALUMINUM COMPANY OF AMERICA
Pittsburgh 19, Pa.
ANDERSON BRASS COMPANY
5308 12th St.
Detroit 8, Mich.
COLUMBIA NUT & BOLT CO., INC.
945 Main Street
Bridgeport 3, Connecticut
HARTFORD MACHINE SCREW CO.
Box 1440
Hartford 2, Connecticut
THE WEATHERHEAD COMPANY
FORT WAYNE DIVISION
128 W. Washington Blvd.
Ft. Wayne, Ind.

Screw Machine Products, Hardened & Ground
THE CHICAGO SCREW COMPANY
2701 Washington Blvd.
Bellwood, Ill.
HARTFORD MACHINE SCREW CO.
Box 1440
Hartford 2, Connecticut

Scrubbers
THE FLUOR CORP., LTD.
2500 S. Atlantic Blvd.
Los Angeles 22, Calif.

Scuffing Rings
A. ALLAN & SON
325 Washington Avenue
Carlstadt, New Jersey

Seals, Automatic Shaft
SCHWITZER-CUMMINS CO.
1125 Massachusetts Ave.
Indianapolis 7, Ind.

Self Retaining Nuts
See also "Nuts".
COLUMBIA NUT & BOLT CO., INC.
945 Main Street
Bridgeport 3, Connecticut

Separators
See also headings under "Centrifuges"; "Conditioners"; "Purifiers"; "Clarifiers".
CENTRICO, INC.
75 West Forest Avenue
Englewood, New Jersey
WARNER LEWIS CO.
Box 3096
Tulsa, Oklahoma

Shafts, Carbon Alloy
ERIE FORGE & STEEL CORP.
15th & Cascade Streets
Erie 1, Pennsylvania

Shafts, Hardened and Ground
ELLWOOD CITY FORGE CO.
Ellwood City, Pennsylvania
ERIE FORGE & STEEL CORP.
15th & Cascade Streets
Erie 1, Pennsylvania
HARTFORD MACHINE SCREW CO.
Box 1440
Hartford 2, Conn.

Signals—Pressure, Liquid Level, Temperature
COLE-HERSEE COMPANY
20 Old Colony Ave.
Boston 27, Mass.
ILLINOIS TESTING LABS., INC.
420 N. LaSalle St.
Chicago 10, Ill.

Silencers, Air Filter, Intake
AIR MAZE CORP.
25000 Miles Road
Cleveland 28, Ohio
BURGESS-MANNING CO.
742 E. Park Ave.
Libertyville, Ill.

Silencers, Exhaust
See also headings under "Mufflers".
BURGESS-MANNING CO.
742 E. Park Ave.
Libertyville, Ill.
THE FLUOR CORP., LTD.
2500 S. Atlantic Blvd.
Los Angeles 22, Calif.
KITTELL MUFFLER & ENGINEERING CO.
915 South Santa Fe Avenue
Los Angeles, California
MAXIM SILENCER CO.
85 Homestead Ave.
Hartford 5, Conn.
WINSLOW ENGINEERING CO.
4069-73 Hollis Street
Oakland 8, Calif.

Silencers, Intake
See heading above.
BURGESS-MANNING CO.
742 E. Park Ave.
Libertyville, Ill.
THE FLUOR CORP., LTD.
2500 S. Atlantic Blvd.
Los Angeles 22, Calif.
KITTELL MUFFLER & ENGINEERING CO.
915 South Santa Fe Avenue
Los Angeles, California
MAXIM SILENCER COMPANY
85 Homestead Avenue
Hartford 5, Connecticut

Solvents
See also "Degreasers".
ASHLAND OIL & REFINING CO.
1409 Winchester Avenue
Ashland, Kentucky
CITIES SERVICE OIL CO.
70 Pine Street
New York, N. Y.

GULF OIL CORP.
GULF REFINING CO.
1822 Gulf Bldg.
Pittsburgh 30, Pennsylvania
SHELL OIL COMPANY
50 W. 60th St.
New York 20, N. Y.
STANDARD OIL CO. OF CALIF.
WESTERN OPERATION DIVISION
225 Bush Street
San Francisco, California

Solvents, Degreasing
See also "Degreasers"

ASHLAND OIL & REFINING CO.
1409 Winchester Ave.
Ashland, Kentucky
BRULIN & COMPANY, INC.
2939-45 Columbia Ave.
Indianapolis 7, Ind.
GUNK CHICAGO CO.
630 N. Harlem Ave.
River Forest, Ill.
OAKITE PRODUCTS, INC.
19 Rector St.
New York, N. Y.
PETROLEUM SOLVENTS CORP.
331 Madison Ave.
New York, N. Y.

Solvents for Petroleum Residues

ASHLAND OIL & REFINING CO.
1409 Winchester Ave.
Ashland, Kentucky
BRULIN & COMPANY, INC.
2939-45 Columbia Ave.
Indianapolis 7, Ind.
KEMIX LABORATORIES
West Springfield, Pa.
OAKITE PRODUCTS, INC.
19 Rector St.
New York 6, N. Y.
PETROLEUM SOLVENTS CORP.
331 Madison Ave.
New York, N. Y.

Spark Arrestors

AIR MAZE CORPORATION
25000 Miles Road
Cleveland 28, Ohio
KITTELL MUFFLER & ENGINEERING CO.
915 South Santa Fe Avenue
Los Angeles, California
MAXIM SILENCER CO.
85 Homestead Ave.
Hartford 5, Conn.

Spark Plugs, Gas Engine

STITT IGNITION COMPANY
86 E. First Avenue
Columbus 1, Ohio

Special Alloy Steel Cylinder & Main Bearing Studs

ERIE BOLT & NUT CO.
1325 Liberty St.
Erie, Pa.

Speedometers

STEWART-WARNER CORP.
1840 W. Diversey Pkwy.
Chicago, Ill.

Speed Reducers and Increasers

BRAD FOOTE GEAR WORKS
1315 S. Cicero Ave.
Cicero 50, Ill.
DELAVAL STEAM TURBINE CO.
Trenton 2, N. J.
DODGE MANUFACTURING CO.
Mishawaka, Ind.
THE SNOW-NABSTEDT GEAR CORP.
251 Welton St.
Hamden, Conn.

Spray Nozzles, Fuel Injection
See also under "Nozzles"; "Valves"

AMERICAN BOSCH DIVISION
AMERICAN BOSCH ARMA CORP.
3664 Main St.
Springfield 7, Mass.
C. A. V. DIVISION of
LUCAS ELECTRICAL SERVICES, INC.
14820 Detroit Avenue
Cleveland 7, Ohio
MICRO-PRECISION DIVISION
MICROMATIC HONE CORP.
2205 Lee Street
Evanston, Illinois
SCINTILLA DIVISION
BENDIX AVIATION CORP.
Sidney, New York

Spray Towers
See also "Cooling Towers".

THE FLUOR CORP., LTD.
2500 S. Atlantic Blvd.
Los Angeles 22, Calif.

Sprockets

DIAMOND CHAIN COMPANY, INC.
402 Kentucky Avenue
Indianapolis 7, Indiana
DODGE MANUFACTURING CORP.
Mishawaka, Ind.
MORSE CHAIN CO.
Ithaca, New York

Stampings, Metal

ATLANTIC MANUFACTURING CO.
559 S. 4th St.
Hamburg, Pa.
UNITED SPECIALTIES CO.
9705 S. Cottage Grove Ave.
Chicago 28, Ill.

Stands Engine

BACHARACH INDUSTRIAL
INSTRUMENT COMPANY
7301 Penn Avenue
Pittsburgh 8, Pa.

Starter Drives

ECLIPSE MACHINE DIVISION
BENDIX AVIATION CORPORATION
Elmira, New York

Starting Air Compressors, Engine Driven
See also headings under "Compressors"

BURMEISTER & WAIN AMERICAN CORP.
17 Battery Place
New York 4, New York
INGERSOLL-RAND CO.
11 Broadway
New York, N. Y.
QUINCY COMPRESSOR CO.
Dept. DP
Quincy, Ill.

Starting Air Compressors, Motor Driven
See also headings above

INGERSOLL-RAND CO.
11 Broadway
New York, N. Y.
QUINCY COMPRESSOR CO.
Dept. DP
Quincy, Ill.

Starting Batteries, Storage
See also headings under "Batteries".

DELCO-REMY DIVISION
GENERAL MOTORS CORP.
2401 Columbus Ave.
Anderson, Ind.
GLOBE-UNION INC.
900 E. Keefe Ave.
Milwaukee 1, Wisc.
WILLARD STORAGE BATTERY CO.
246-286 E. 131st St.
Cleveland 1, Ohio

Starting Engines, Gasoline

HERCULES MOTOR CORP.
11th & Market S. E.
Canton, Ohio

Starting Motors, Air
See also "Air Starting Motors".

INGERSOLL-RAND CO.
11 Broadway
New York, N. Y.
LEECE-NEVILLE COMPANY
5109 Hamilton Avenue
Cleveland 14, Ohio
SCHWITZER-CUMMINS CO.
1125 Massachusetts Ave.
Indianapolis 7, Ind.

Starting Motors, Electric
See also "Cranking Motors, Electric".

DELCO-REMY DIVISION
GENERAL MOTORS CORP.
2401 Columbus Ave.
Anderson, Ind.
LEECE-NEVILLE COMPANY
5109 Hamilton Avenue
Cleveland 14, Ohio

Starting Motors, Hydraulic

HYDRAMOTIVE, INC.
2323 E. 67th Street
Cleveland 4, Ohio

Steam Boilers

CLAYTON MFG. CO.
El Monte, Calif.

Steam Cleaning Equipment

CLAYTON MANUFACTURING CO.
401 N. Temple City Boulevard
El Monte, California
OAKITE PRODUCTS, INC.
19 Rector St.
New York 6, N. Y.

Steam Generators

CLAYTON MFG. CO.
El Monte, Calif.

Strainers, Oil

CUNO ENGINEERING CORP.
80 South Vine St.
Meriden, Conn.
ELLIOTT COMPANY
Jeannette, Penna.
WM. W. NUGENT & CO., INC.
410-14 N. Hermitage Ave.
Chicago 22, Ill.

Strainers, Water

CUNO ENGINEERING CORP.
80 South Vine St.
Meriden, Conn.
ELLIOTT COMPANY
Jeannette, Pa.
WM. W. NUGENT & CO., INC.
410-412 W. Hermitage Avenue
Chicago 22, Illinois

Strainers, Water, Single & Duplex

CUNO ENGINEERING CORP.
80 S. Vine Street
Meriden, Connecticut

Supercharger Intercoolers
See also "Intercoolers"

HARRISON RADIATOR DIVISION
GENERAL MOTORS CORPORATION
Lockport, N. Y.
YOUNG RADIATOR COMPANY
709 S. Marquette St.
Racine, Wisconsin

Supercharging Blowers
See also "Blowers, Scavenging and Supercharging"; "Turbochargers, Superchargers".

DELAVAL STEAM TURBINE CO.
Trenton 2, N. J.

MIEHLE-DEXTER SUPERCHARGER DIVN.
THE DEXTER FOLDER COMPANY
Racine, Wisconsin
SCHWITZER-CUMMINS CO.
1125 Massachusetts Ave.
Indianapolis, Ind.

Supplemental Additives
KEMIX LABORATORIES
West Springfield, Pa.

Switchboards and Instruments
THE IDEAL ELECTRIC & MFG. CO.
Mansfield, Ohio

Switches Automatic Transfer
AUTOMATIC SWITCH CO.
391 Lakeside Avenue
Orange, New Jersey

Switches, Hydraulic
COLE-HERSEE COMPANY
20 Old Colony Avenue
Boston 27, Mass.

Switches, Manual
COLE-HERSEE COMPANY
20 Old Colony Avenue
Boston 27, Mass.

Switches, Master Disconnect
COLE-HERSEE COMPANY
20 Old Colony Avenue
Boston 27, Mass.

Switches, Push-Button
COLE-HERSEE COMPANY
20 Old Colony Avenue
Boston 27, Mass.

Switches, Solenoid
COLE-HERSEE COMPANY
20 Old Colony Avenue
Boston 27, Mass.
DELCO-REMY DIV.
GENERAL MOTORS CORP.
2401 Columbus Avenue
Anderson, Indiana
SYNCHRO-START PRODUCTS, INC.
8151 N. Ridgeway Avenue
Skokie, Illinois

Switches, Starting
COLE-HERSEE COMPANY
20 Old Colony Avenue
Boston 27, Mass.
DELCO-REMY DIVISION
GENERAL MOTORS CORPORATION
2401 Columbus Avenue
Anderson, Indiana
LEECE-NEVILLE COMPANY
5109 Hamilton Avenue
Cleveland 14, Ohio

Switchgear
BROWN BOVERI CORPORATION
19 Rector Street
New York 6, N. Y.
CONSOLIDATED DIESEL ELECTRIC CORP.
GENERATOR SET DIVISION
Ludlow & Canal Streets
Stamford, Conn.
ELECTRIC MACHINERY & MFG. CO.
800 Central Avenue
Minneapolis 13, Minn.

Synchronizers, Automatic
ELECTRIC MACHINERY MFG. CO.
800 Central Avenue
Minneapolis 13, Minn.

Systems, Fuel Injection
See also headings under "Injection"; "Fuel"; "Nozzles", etc.
HARTFORD MACHINE SCREW CO.
Box 1440
Hartford 2, Connecticut

Tachographs, Hand
O. ZERNICKOW CO.
15 Park Row
New York 38, N. Y.

Tachometers, Centrifugal
STEWART-WARNER CORPORATION
1840 W. Diversey Pkwy.
Chicago, Illinois
HERMAN H. STICHT CO., INC.
27 Park Place
New York 7, New York
O. ZERNICKOW CO.
15 Park Row
New York 38, N. Y.

Tachometers, Electrical
RELIANCE ELECTRIC & ENGINEERING CO.
1088 Ivanhoe Road
Cleveland 10, Ohio
ROCHESTER MFG. CO., INC.
9 Rockwood Place
Rochester 10, New York
STEWART-WARNER CORPORATION
1840 W. Diversey Pkwy.
Chicago, Illinois
SUN ELECTRIC CORPORATION
6395 No. Avondale
Chicago 31, Ill.

Tachometers, Hand
STEWART-WARNER CORPORATION
1840 W. Diversey Pkwy.
Chicago, Illinois
HERMAN H. STICHT CO., INC.
27 Park Place
New York 7, New York

Tachometers, Mechanical
STEWART-WARNER CORPORATION
1840 W. Diversey Pkwy.
Chicago, Illinois
HERMAN H. STICHT CO., INC.
27 Park Place
New York 7, New York
SUN ELECTRIC CORPORATION
6395 No. Avondale
Chicago 31, Ill.

Temperature Recorders
BACHARACH INDUSTRIAL INSTRUMENT COMPANY
7301 Penn Avenue
Pittsburgh 8, Pa.
THE POWERS REGULATOR CO.
3400 Oakton Street
Skokie, Illinois

Temperature Regulators, Cooling Water
AMOT CONTROLS CORP.
P. O. Box 1707
Richmond 1, Calif.
DETROIT CONTROLS CORP.
5900 Trumbull Avenue
Detroit, Michigan
THE POWERS REGULATOR CO.
3400 Oakton Street
Skokie, Illinois

Temperature Switches
See also, "Switches"
AMOT CONTROLS CORP.
P. O. Box 1707
Richmond 1, Calif.

Test Equipment, Injection & Governor
DIESEL CONTROL CORP.
266 N. Marine Avenue
Wilmington, Calif.

Test Stands & Adapters
CLAYTON MFG. CO.
El Monte, Calif.

Test Stands, Diesel Fuel Pump
BACHARACH INDUSTRIAL INSTRUMENT COMPANY
7301 Penn Avenue
Pittsburgh 8, Pa.

Testers, Battery
WILLARD STORAGE BATTERY CO.
246 East 131 Street
Cleveland 1, Ohio

Testers, Nozzle
BACHARACH INDUSTRIAL INSTRUMENT COMPANY
7301 Penn Avenue
Pittsburgh 8, Pa.
KIENE DIESEL ACCESSORIES, INC.
10352 Pacific Avenue
Franklin Park, Illinois

Testing Instruments, Electrical
ELECTRO PRODUCTS LABORATORIES
4501 N. Ravenwood Ave.
Chicago 40, Ill.

Testing Instruments, Oil
THE GERIN CORPORATION
Avon, N. J.

Thermocouples
ILLINOIS TESTING LABORATORIES, INC.
420 N. LaSalle St.
Chicago 10, Ill.

Thermometers
BACHARACH INDUSTRIAL INSTRUMENT COMPANY
7301 Penn Avenue
Pittsburgh 8, Pa.
ILLINOIS TESTING LABS., INC.
420 N. La Salle Street
Chicago 10, Ill.
POWERS REGULATOR COMPANY
3400 Oakton Street
Skokie, Illinois

Thermometers, Dial Indicator
W. C. DILLON & COMPANY, INC.
14620 Keswick Street
Van Nuys, California
THE ELECTRIC AUTO-LITE CO.
1201 Champlain Street
Toledo 1, Ohio
ROCHESTER MFG. CO., INC.
9 Rockwood Place
Rochester 10, New York

Thermometers, Dial Indicating, Distance Type
THE ELECTRIC AUTO-LITE COMPANY
1201 Champlain Street
Toledo 1, Ohio
ILLINOIS TESTING LABS., INC.
420 N. La Salle Street
Chicago 10, Ill.
ROCHESTER MFG. CO., INC.
9 Rockwood Place
Rochester 10, New York

Thermometers, Flue Gas
BACHARACH INDUSTRIAL INSTRUMENT COMPANY
7301 Penn Avenue
Pittsburgh 8, Pa.
W. C. DILLON & CO., INC.
14620 Keswick Street
Van Nuys, Calif.
ILLINOIS TESTING LABS., INC.
420 N. La Salle Street
Chicago 10, Ill.

Thermometers, Indicating
ILLINOIS TESTING LABS., INC.
420 N. La Salle Street
Chicago 10, Ill.
ROCHESTER MFG. CO., INC.
9 Rockwood Place
Rochester 10, New York

Thermometers, Portable Recording
BACHARACH INDUSTRIAL INSTRUMENT CO.
7301 Penn Avenue
Pittsburgh 8, Pa.
THE ELECTRIC AUTO-LITE CO.
1201 Champlain Street
Toledo 1, Ohio

Timing Chains
See also "Chains, Timing"
MORSE CHAIN CO.
Ithaca, New York

Tools, Diesel Engine Service
BACHARACH INDUSTRIAL INSTRUMENT CO.
7301 Penn Avenue
Pittsburgh 8, Pa.
SNAP-ON TOOLS CORP.
8064 28th Avenue
Kenosha, Wisconsin

Tools, Mechanic's Hand
BONNEY FORGE & TOOL WORKS
716 Meadow Street
Allentown, Pa.
PROTO TOOLS
2209 Santa Fe Avenue
Los Angeles 54, Calif.
SNAP-ON TOOLS CORP.
8064 28th Avenue
Kenosha, Wis.

Torque Converters
ALLISON DIVISION
GENERAL MOTORS CORPORATION
P. O. Box 894
Indianapolis 6, Ind.

Towers, Cooling
THE FLUOR CORP., LTD.
2500 S. Atlantic Blvd.
Los Angeles 22, Calif.
J. F. PRITCHARD & CO. OF CALIF.
4625 Roanoke Pky.
Kansas City 12, Missouri

Trained Diesel Mechanics
UTILITIES ENGINEERING INSTITUTE
2525 N. Sheffield Ave.
Chicago 14, Ill.

Transmissions
BRAD FOOTE GEAR WORKS
1315 S. Cicero Ave.
Cicero 50, Ill.

Transmissions, Hydraulic
ALLISON DIVISION
GENERAL MOTORS CORPORATION
P. O. Box 894
Indianapolis 6, Ind.

Transmissions, Multispeed
COTTA TRANSMISSION COMPANY
2340 11th Street
Rockford, Ill.

Tubing, Corrugated, Flexible Metallic
See also headings under "Flexible" and "Hose".
ALLIED METAL HOSE COMPANY
37-46 Ninth Street
Long Island City 1, N. Y.
THE AMERICAN BRASS CO.
AMERICAN METAL HOSE DIVISION
698 S. Main Street
Waterbury 20, Conn.
ATLANTIC METAL HOSE CO., INC.
309 Dyckman Street
New York 34, N. Y.

Tubing, Flexible Metal
See heading above.
THE AMERICAN BRASS COMPANY
AMERICAN METAL HOSE. DIVISION
698 S. Main Street
Waterbury 20, Conn.
ATLANTIC METAL HOSE CO., INC.
309 Dyckman Street
New York 34, N. Y.

Tubing, Flexible, Non-Metallic
RESISTOFLEX CORP.
39 Plansoen St.
Belleville, N. J.
THE WEATHERHEAD CO.
FORT WAYNE DIVISION
128 W. Washington Blvd.
Ft. Wayne, Ind.

Tubing, High Pressure
THE WEATHERHEAD CO.
FORT WAYNE DIVISION
128 W. Washington Blvd.
Ft. Wayne, Ind.

Turbochargers, Superchargers
See also headings under "Blowers"; "Supercharging Blowers"; "Scavenging Air Blowers".
BROWN BOVERI CORPORATION
19 Rector Street
New York 6, New York
DE LAVAL STEAM TURBINE CO.
Trenton 2, N. J.
ELLIOTT COMPANY
Jeannette, Penna.
THE GARRETT CORP.
AIRESEARCH INDUSTRIAL DIV.
9225 Aviation Blvd.
Los Angeles 45, Calif.
MIEHLE-DEXTER SUPERCHARGER DIV.
DEXTER FOLDER CO.
100 Fourth St.
Racine, Wisc.
SCHWITZER-CUMMINS COMPANY
1125 Massachusetts Avenue
Indianapolis 7, Indiana

Unit Injectors, Fuel Oil
AMERICAN BOSCH DIV.
AMERICAN BOSCH ARMA CORP.
3664 Main Street
Springfield 7, Mass.

Unit Injector Test Stand
KIENE DIESEL ACCESSORIES, INC.
10352 Pacific St.
Franklin Park, Ill.

Valve Adjusters, Hydraulic
EATON MFG. CO.
VALVE AND SAGINAW DIVISIONS
9771 French Road
Detroit 13, Mich.

Valve Discs
THE ANCHOR PACKING CO.
401 N. Broad Street
Philadelphia, Pa.

Valve Facing Machines
CEDAR RAPIDS ENGINEERING CO.
902 17th Street N.E.
Cedar Rapids, Iowa

Valve Regrinders
SNAP-ON TOOLS CORP.
8064 28th Avenue
Kenosha, Wisconsin
VAN NORMAN COMPANY
3640 Main Street
Springfield 7, Mass.

Valve Seat Grinders
HALL-TOLEDO DIVISION
BAKER BROS., INC.
138-142 Sylvania Ave.
Toledo 12, Ohio
CEDAR RAPIDS ENGINEERING CO.
902 17th St. N.E.
Cedar Rapids, Iowa

Valve Seat Insert Tools
CEDAR RAPIDS ENGINEERING CO.
902 17th St. N.E.
Cedar Rapids, Iowa
PETERSON WELDING LAB.
1423 Virginia
Kansas City 6, Mo.

Valve Seat Inserts
EATON MFG. CO.
739 E. 140th St.
Cleveland 10, O.
EATON MFG. CO.
VALVE AND SAGINAW DIVISIONS
9771 French Road
Detroit 13, Mich.
PETERSON WELDING LABS., INC.
1423 Virginia Avenue
Kansas City 6, Missouri

Valve Seats
EATON MFG. CO.
739 E. 140th St.
Cleveland 10, O.
EATON MFG. CO.
VALVE AND SAGINAW DIVISIONS
9771 French Road
Detroit 13, Mich.
PETERSON WELDING LABS., INC.
1423 Virginia Avenue
Kansas City 6, Missouri

Valve Tappets
THE CHICAGO SCREW COMPANY
2701 Washington Blvd.
Bellwood, Ill.
EATON MFG. CO.
739 E. 140th St.
Cleveland 10, O.
EATON MFG. CO.
VALVE AND SAGINAW DIVISIONS
9771 French Road
Detroit 13, Mich.
HARTFORD MACHINE SCREW CO.
Box 1440
Hartford 2, Conn.

Valves, Engine Indicator
BACHARACH INDUSTRIAL INSTRUMENT CO.
7301 Penn Ave.
Pittsburgh 8, Pa.
KIENE DIESEL ACCESSORIES INC.
10352 Pacific Ave.
Franklin Park, Illinois

Valves, Packless
FULTON SYLPHON DIVISION
ROBERTSHAW-FULTON CONTROLS CO.
P. O. Box 400
Knoxville 4, Tenn.

Valves, Poppet
EATON MFG. CO.
739 E. 140th St.
Cleveland 10, O.
EATON MFG. CO.
VALVE AND SAGINAW DIVISIONS
9771 French Road
Detroit 13, Mich.

Valves, Poppet, Faced
EATON MFG. CO.
VALVE AND SAGINAW DIVISIONS
9771 French Road
Detroit 13, Mich.

Valves Poppet, Free (Rotating)
EATON MFG. CO.
VALVE AND SAGINAW DIVISIONS
9771 French Road
Detroit 13, Mich.

Valves, Selector, 3-Way or 4-Way
ANDERSON BRASS COMPANY
5308 12th St.
Detroit 8, Mich.

Valves, Selector, 6-Port & 9-Port
ANDERSON BRASS COMPANY
5308 12th St.
Detroit 8, Mich.

Valves, Shutoff, Fuel Line

ANDERSON BRASS COMPANY
5308 Twelfth Street
Detroit 8, Michigan

Valves, Sight-Feed

WM. W. NUGENT & CO., INC.
410-412 N. Hermitage Ave.
Chicago 22, Illinois

Valves, Solenoid Operated

AUTOMATIC SWITCH CO.
391 Lakeside Ave.
Orange, New Jersey

Valves, Thermostatic

AMOT CONTROLS CORP.
P. O. Box 1707
Richmond, Calif.

THE POWERS REGULATOR COMPANY
3400 Oakton Street
Skokie, Illinois

Valves, 3-Way

AIRMATIC VALVE, INC.
7316 Associate Avenue
Cleveland 9, Ohio

THE WEATHERHEAD COMPANY
FORT WAYNE DIVISION
128 W. Washington Blvd.
Ft. Wayne, Indiana

Variable Speed Drives

ALLISON DIVISION
GENERAL MOTORS CORP.
P. O. Box 894
Indianapolis 6, Indiana

BACHARACH INDUSTRIAL
INSTRUMENT COMPANY
7301 Penn Avenue
Pittsburgh 8, Pennsylvania

MORSE CHAIN COMPANY
Ithaca, New York

Variable Speed Transmissions

MORSE CHAIN COMPANY
Ithaca, New York

Vessels, Pressure

WARNER LEWIS COMPANY
Box 3096
Tulsa, Oklahoma

Vibration Control

THE KORFUND COMPANY, INC.
48-19 32nd Place
Long Island City 1, New York

SCHWITZER CUMMINS COMPANY
1125 Massachusetts
Indianapolis 7, Indiana

Vibration Eliminators

ALLIED METAL HOSE COMPANY
37-46 Ninth Street
Long Island City 1, N. Y.

THE AMERICAN BRASS COMPANY
AMERICAN METAL HOSE DIVISION
698 South Main Street
Waterbury 20, Connecticut

THE KORFUND CO., INC.
48-19 32nd Place
Long Island City 1, New York

Viscosity Indicating Devices

THE GERIN CORPORATION
Avon, New Jersey

Voltage Controls

COLE-HERSEE COMPANY
20 Old Colony Avenue
Boston 27, Mass.

Voltage Regulators

BROWN BOVERI CORPORATION
19 Rector Street
New York 6, N. Y.

DELCO-REMY DIVISION
GENERAL MOTORS CORPORATION
2401 Columbus Avenue
Anderson, Indiana

Volt-Ammeters, Clamp-on Type

COLUMBIA ELECTRIC MFG. CO.
4519 Hamilton Avenue
Cleveland 14, Ohio

Waste Heat Boilers

THE MAXIM SILENCER CO.
Homestead Avenue
Hartford, Connecticut

Water Cooling Equipment

THE FLUOR CORP., LTD.
2500 So. Atlantic Blvd.
Los Angeles 22, California

YOUNG RADIATOR COMPANY
709 So. Marquette St.
Racine, Wisconsin

Water Separators & Filters

THE BRIGGS FILTRATION COMPANY
River Road
Washington 16, D. C.

CENTRICO, INC.
75 West Forest Avenue
Englewood, New Jersey

COMMERCIAL FILTERS CORPORATION
2 Main Street
Melrose 76, Mass.

FRAM CORPORATION
Providence 16, Rhode Island

PERRY FILTER DIVISION
R. M. HOLLINGSHEAD CORP.
840 Cooper Street
Camden 2, New Jersey

Water Softeners

PERRY FILTER DIVISION
R. M. HOLLINGSHEAD CORP.
840 Cooper Street
Camden 2, New Jersey

Water Temperature Regulators

See alo "Temperature Regulators, Cooling Water"; "Regulators, Temperature".

AMOT CONTROLS CORP.
P. O. Box 1707
Richmond, California

THE POWERS REGULATOR CO.
3400 Oakton Street
Skokie, Illinois

Wearing Rings

A. ALLAN & SON
325 Washington Avenue
Carlstadt, New Jersey

Welding, Diesel Parts

GRAVER TANK & MFG., CO., INC.
4809 Tod Avenue
East Chicago, Indiana

RALPH STARK, INC.
43-12 32nd Street
Long Island City 1, New York

Weldments

GRAVER TANK & MFG., CO., INC.
4809 Tod Avenue
East Chicago, Indiana

Windshield Wipers, Electric

AMERICAN BOSCH CORPORATION
AMERICAN BOSCH ARMA CORP.
3664 Main Street
Springfield 7, Mass.

Wire & Cable

ALUMINUM COMPANY OF AMERICA
Pittsburgh 19, Pennsylvania

WILLARD STORAGE BATTERY COMPANY
246-286 East 131st Street
Cleveland 1, Ohio

Worm Gears

BRAD FOOTE GEAR WORKS
1315 So. Cicero Avenue
Cicero 50, Illinois

Wrenches

See also "Tools".

PROTO TOOLS
2209 Santa Fe Avenue
Los Angeles 54, Calif.

SNAP-ON TOOLS CORP.
8064 28th Avenue
Kenosha, Wisconsin

Wrenches, Box, Open End

BONNEY FORGE & TOOL WORKS
716 Meadow Street
Allentown, Pennsylvania

PROTO TOOLS
2209 Santa Fe Avenue
Los Angeles 54, Calif.

SNAP-ON TOOLS CORP.
8064 28th Avenue
Kenosha, Wisconsin

Wrenches, Socket

BONNEY FORGE & TOOL WORKS
716 Meadow Street
Allentown, Pennsylvania

PROTO TOOLS
2209 Santa Fe Avenue
Los Angeles 54, Calif.

SNAP-ON TOOLS CORP.
8064 28th Avenue
Kenosha, Wisconsin

Wrenches, Torque

BONNEY FORGE & TOOL WORKS
716 Meadow Street
Allentown, Pennsylvania

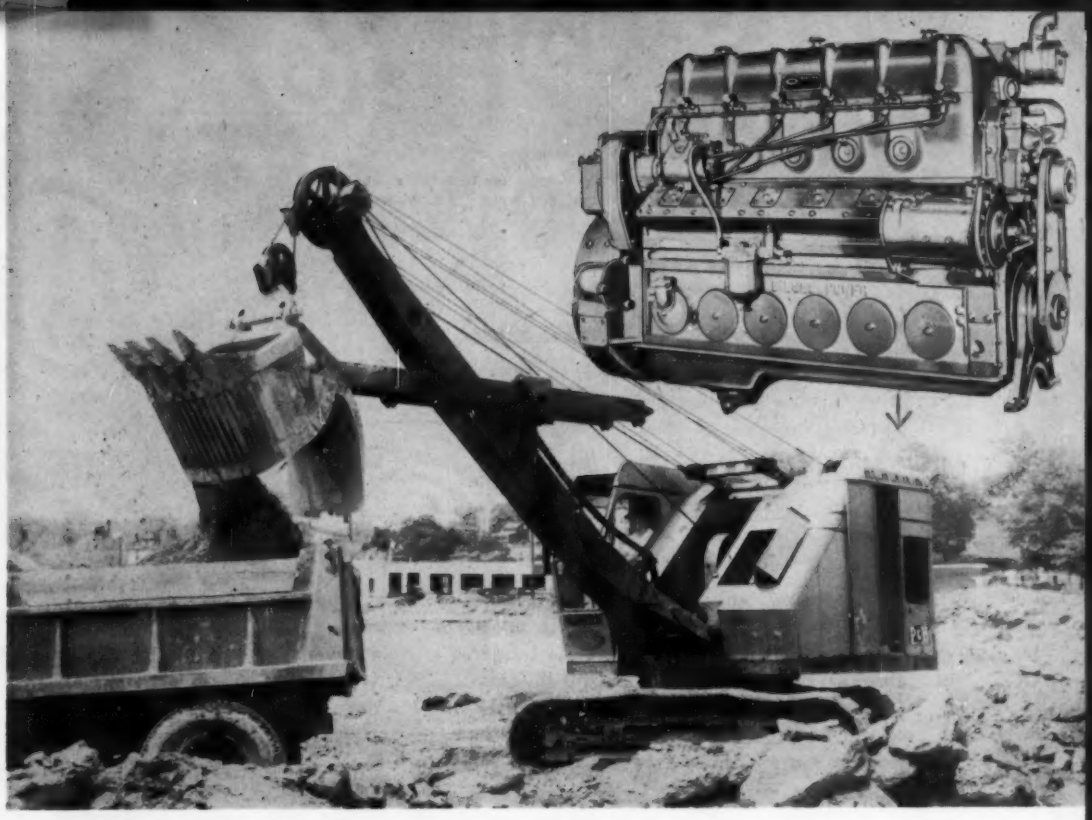
PROTO TOOLS
2209 Santa Fe Avenue
Los Angeles 54, Calif.

SNAP-ON TOOLS CORP.
8064 28th Avenue
Kenosha, Wisconsin

P. A. STURTEVANT COMPANY
Addison, Illinois

SUNNEN PRODUCTS CO.
7954 Manchester
St. Louis 17, Missouri

Please remember to say you saw it in Diesel Power



New Fuel System for P & H Diesels

During 1954, Harnischfeger redesigned for higher output improved performance and better power-to-weight ratio. This year, the RoosaMaster injection system has been added.

LATEST development from the Harnischfeger Corporation is the use of RoosaMaster fuel injection equipment as standard equipment on P&H diesels. This marks another step in lowering the power-to-weight ratio which should solve some problems in applications where this factor is critical.

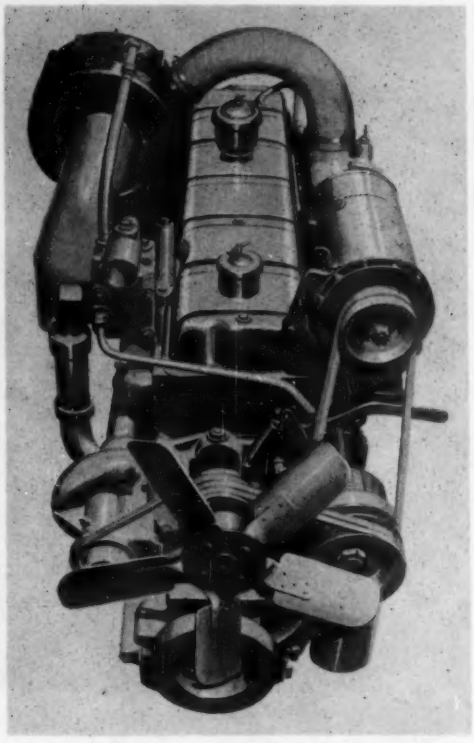
Weight and space savings are features of the new system as are construction, adjustment and maintenance. The new fuel injection system does away with a total of 131 separate parts and is more compact. Weight of the new system is 49.5 lb lighter.

Another feature of the new system is easier starting with injection automatically retarded until engine speed reaches 500 rpm. P&H states that this results in good idling characteristics as well as smoother operation. Engine torque characteristics are also said to be improved with the new pump which, in mobile equipment, result in better performance and greater responsiveness to operator's control.

Described as a single-cylinder, opposed-plunger, inlet-metering, distributor-type pump, (see DIESEL POWER Nov., 1952 and March, 1955) it is a sealed and fully self-contained unit. It incorporates a vane-type fuel transfer pump, metering arrangement, rotor assembly consisting of the rotor, the injection plungers and shoes, and governor weight assembly, internal cam ring with timing control, and rest of governor. The pump is self-lubricating and has no ball bearings, no operating valves and no gears. Being a distributor-type pump, it has the same number of parts for each P&H engine regardless of whether it is a 2-cyl or 6-cyl model.

To eliminate "dribble" and consequently carbon build-up on the injector tips and resultant interference with spray pattern and/or clogging, the pump has been designed for sharp cutoff of injection. This is done by a cam ring design which allows the plungers to retract sharply when injection is complete and the discharge ports are still indexed.

According to the announcement, which was made only after the RoosaMaster system designed for P&H diesels was thoroughly tested, stated that premium lightweight fuels are not required with this system.



Model JT-6 for vehicular application is rated 175 hp at 2500 rpm and weighs 9.2 lb per hp.

Cummins' JT-6 "Turbodiesel"

Representing well over 50% of motive power for trucks above 26,000 lb GVW, diesels are beginning their bid for leadership in the 19,500- to 26,000-lb class. Cummins' new lightweight JT-6, turbocharged and with a simple fuel injection system, is the latest challenger.

FULFILLING the logical sequence of events that began with the development of its diesel race car, Cummins Engine Company, Inc., has come up with a turbocharged diesel designed to invade the middleweight truck market. The new engine has the same basic design and displacement as the race car power unit. Its high horsepower, light weight, and economy advantages are expected to attract operators using trucks in the 19,500 to 26,000 GVW class where diesels are now the minority. To the contractor, mine and quarry operator, major appeal will be the reduction in hourly operating costs for medium-heavy-duty dumps, ready-mix trucks, etc.

This new engine—the JT-6 Turbodiesel—produces 175 hp. It is a 6-cyl, inline type with 4 1/8-in bore and 5-in stroke, and has a displacement of 401 cu in. Weighing 800 lb less than other Cummins diesels of equivalent horsepower, it is comparable in weight to gasoline engines of similar power. The JT-6 weighs 1615 lb, or only 9.2 lb per hp.

Turbocharging

Key to the high horsepower available from this small engine is its use of normally wasted exhaust gas energy for added power. This is accomplished by piping the exhaust through the turbine element of a turbocharger where its energy is converted to provide power to a blower impeller. The blower impeller supplies air to the engine's intake manifold and cylinders at pressures higher than atmospheric.

This greater weight of air forced into the cylinders allows a greater quantity of fuel to be burned so that engine output is increased. In addition, the completeness of exhaust scavenging plus the cooling effect during blow-through while all valves are open (overlap period), reduces the heat load on the internal engine parts. Result is that the JT-6 develops 40% more power than its naturally-aspirated counterpart without equivalent increase in temperature of the cylinder parts. A Schwitzer-Cummins turbocharger is used. (Larger engines in the J series employ Elliott turbochargers.)

Horsepower, weight, and efficiency of the JT compared with naturally-aspirated and mechanically-supercharged engines of the J series is presented in tabular form. The improved performance made possible by a new 4-valve head design, with better breathing characteristics, is also shown. The power and economy superiority of the JNS-6 to the JS-600 is due to this same (two intake, two exhaust) valve design. In the development sequence, the combination of turbocharging and the new cylinder head design allows the JT-6 to develop 175 hp with the same quantity of fuel used by the JS-600 to develop 150 hp.

Laboratory tests conducted by the company have indicated that the new engine will show less decrease in power as air density decreases with altitude. The definite point of power drop has not as yet been determined. However, from sea level to altitudes above 5000 ft, maximum engine power appears to be the same. Reason given

Engine Model Type	JN-6 Naturally-Aspirated 4 Valve Head	JS-600 Super-charged 2 Valve Head	JNS-6 Super-charged 4 Valve Head	JT-6 Turbo-diesel 4 Valve Head
Flywheel horsepower	125	150	165	175
Governed speed (rpm)	2500	2500	2500	2500
Displacement (cu in)	401	401	401	401
Horsepower per cu in	.312	.373	.412	.435
Lb per horsepower	11.6	10.3	9.4	9.2
Fuel consumption gph (at maximum hp)	7.6	10.6	10.6	10.6
Lb per bhp hour	.440	.515	.466	.440

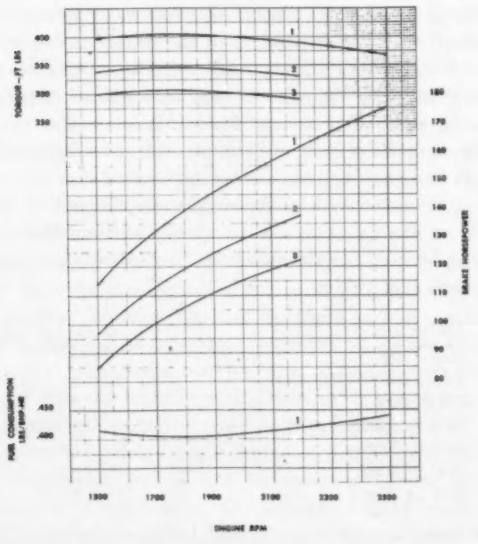
for this is that the turbocharger rotates more rapidly as the air pressure decreases. A larger air volume is pumped by the higher blower speed, but it contains approximately the same weight of air as at lower altitudes.

The JT-6 usually mounts its turbocharger above the exhaust manifold on the right-hand side of the engine. Air is piped across the top of the engine to the intake manifold. In special requirements, mountings are also possible for other locations at the rear and side of the engine.

Fuel Injection System

One of the most important features of Cummins' race car was its new fuel injection system. Since the middle of last year (see DIESEL POWER, August, 1954), this PT fuel system has been made standard on all Cummins diesels. It has made the diesel easier to understand and simpler to service than the gasoline engine with its complicated carburetion and its ignition system. The simplified system has been another factor in making possible the development of this smaller, lightweight engine.

Briefly, the PT is a continuous-flow type system needing no timing adjustment. It uses five simple components: a fuel pump to drive fuel through the system; a pressure regulator to control system pressure; a throttle to control amount of fuel delivered; a governor to control pressure at idling speed and limit maximum rpm; and an injector that performs both metering and injection. Plunger operation for actual injection is obtained from the engine camshaft to accurately control timing of the start of injection. Fuel is forced into the combustion chamber on the downstroke of the injector.



Model JT-6 torque, horsepower and fuel consumption curves for (1) on-and off-highway trucks, tractors, etc; (2) suggested ratings for intermittant industrial power applications; and (3) suggested ratings for continuous duty applications.

Compared to its predecessors, the PT pump shows not only a great reduction in parts, but a major reduction in size and weight. It has 12.5% of the bulk of Cummins' single-disc pump, weighs 13 lb in contrast to the same pump's 104 lb, and consists of 182 parts to the former's 415 parts. The last is an important item of cost reduction. It is estimated that about a half-hour's instruction is all that is necessary to acquaint the average mechanic with all service operations. No special skill is required.

Some Construction Features

Valves and injectors are actuated from the engine camshaft through a push-tube and rocker lever linkage. To give long life, the valve seats are stellite inserts; the exhaust valves also having stellite facing. Each cylinder head is a single casting with large water passages for cooling of the injector and valves.

The counterbalanced crankshaft has seven 3 7/8-in diam main bearing journals. Bearing journals of the crankpin are 2 5/8-in diam. All the journals are Tocco-hardened and copper-lead strip-type bearings are used for all main and crankpin bearings. Connecting rods are I-beam section steel forgings with 9½-in length, center to center.

The lubricating oil pump, located in the oil pan, is driven from the engine gear train. Oil, pumped through a tubular-type oil cooler, flows through passages in the block and crankshaft to the main and connecting rod bearings.

The engine uses a 12-v electric system, this decrease in the usual number of batteries making for an additional weight saving in the chassis. Starting is by means of a key switch on the dash which actuates the electric starting motor, at the same time opening the shutdown valve on the fuel system.

Quick Manufacturer Acceptance

Release of this new engine followed 15 million miles of field test and preproduction operation. The JT-6 has already been incorporated by leading truck manufacturers for their lightweight, space-saver designs. It is now available in the Diamond T Model 723 tilt cab and 723 conventional tractor. Freightliner uses it in its Spacemaker, and Hendrickson in its BD-24 Space-Saver. It powers International Harvester's Series 190, 200, 300, and 400 tilt cabs, Kenworth's cab-beside-engine tractor, and White's new 9000 TD. Beck, Flxible, and Fitzjohn are also making it available for their intercity buses.

Core guard screen on forced-draft, vertical air-discharge radiator.

Picking a Radiator

by H. J. KINKADE

Sales Engineer, Young Radiator Company

In selecting the proper radiator it is necessary that you know what to specify and what not to specify. Some items are best left up to the radiator manufacturer.

PROPER cooling is essential to efficient, trouble-free engine operation. Although only one contributor to the overall operation, the cooling system can greatly extend or drastically shorten the life of an engine. The engine manufacturer took care of the water jackets when the engine was designed, but what about the radiator? In some cases this will be your baby, and radiator specifications will have to be written.

The radiator must be of the proper design to suit the particular installation. Economy must also enter the picture, but not to the extent that it outweighs proper installation.

Methods of Cooling

There are in general use, four methods of cooling large internal combustion engines with a radiator. These are illustrated in order of preference and as will be noted, have a number of things in common. In all four systems, regardless of whether lubricating oil or engine jacket water is cooled directly or indirectly, thermostatic 3-way bypass valves control temperature.

In the case of Figs. 1, 2, and 3, a remote pushbutton station for manual fan motor control through an automatic starter is generally used; while with Fig. 4 a thermostatically controlled pilot circuit automatically starts and stops the fan motor. Again in Fig. 4, there is another variation in control in that hand-operated valves are used to distribute water from the radiator through the heat exchangers.

Specifications

The most important items to specify in selecting a radiator are as follows:

1. Heat (Btu per hr) to be dissipated from engine jacket water.
2. Heat (Btu per hr) to be dissipated from lube oil.
3. Jacket water and lubricating oil temperatures from the engine.
4. Gpm of water through the engine jackets.
5. Gpm of lubricating oil through the engine and cooler.
6. Design ambient air temperature.
7. Installation elevation above sea level.

Items 6 and 7 can always be specified in figures, while items 1 to 5 will depend upon the engine make, model, and horsepower. If known before radiator specifications are written, all these items may be specified exactly. If engine make, etc., are not known, it is usual to specify "the amounts of heat to be dissipated, temperatures, and flows for engine jacket water and lubricating oil shall be as recommended by the engine manufacturer."

It is usually advisable to specify the maximum fan hp to be used for the radiator. The following table can be used as a guide:

Engine Hp	% of HP for Fan
under 100	5
100 to 500	4
500 to 1000	3
1000 to 1500	2
1500 to 2000	1.5
2000 to 3000	1.25
3000 or over	1

General specifications should indicate whether a horizontal-coils, vertical-air-flow or vertical-coils, horizontal-air-flow unit is wanted. Also specify whether forced draft, induced draft, or either one is acceptable. Like-

wise, type of frame construction and plenum chamber construction are desirable specifications.

Considering the above points, the following considerations enter: The horizontal-coil, vertical-air-flow type is less affected by wind direction and lends itself better to freeze protection if located outside the engine room. The vertical-coil, horizontal-flow type usually costs less and can be placed in or near an engine room wall, permitting hot air recirculation both to keep itself warm and add heat to the engine room. If horizontal core radiators are specified, tubes should be pitched for drainage. If a vertical coil type is desired, it is better to have the water tubes in a vertical position for drainage.

Regarding the merits of induced and forced draft, induced draft will give more uniform air velocity through the radiator core and less air turbulence. This is offset by the increased air turbulence from a forced draft fan which increases heat transfer. However, while the induced draft fan must handle the hot air from the radiator, the forced draft fan handles the cooler air before it enters the radiator.

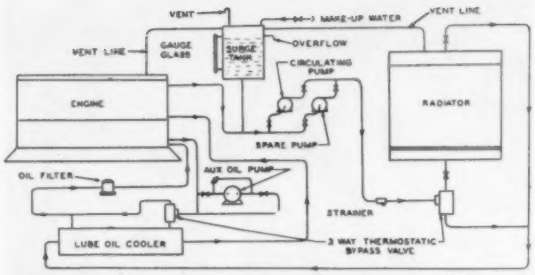
Since hot air is less dense, the induced draft fan must operate at a higher speed, consuming more horsepower than a forced draft fan, to produce the same air flow. Tests prove that the forced draft fan is more efficient than the induced draft type in terms of Btu per hr of heat dissipated per fan hp. This gain in efficiency varies with several factors of radiator construction from 1% to 8%.

With regard to frame construction, it is generally of steel, adequately reinforced to withstand winds of 50 mph velocity. The plenum chamber and other sheet metal parts should be made of 14 gauge steel or heavier. In a horizontal fan radiator, the fan and motor are usually mounted separately from the main radiator frame and not mechanically connected to it.

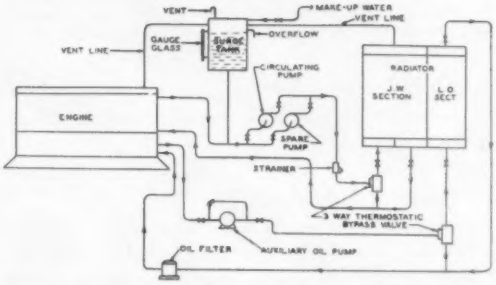
With regard to the actual cooling cores, coils should have either removable end tanks or removable tank covers for immediate access to all tube ends. The number of water passes through the radiator core should not be specified in most cases. It should not be specified whether cross flow or counterflow should be used. Core depth in the direction of air flow or number of rows deep should not be specified.

The reasons for not specifying these items is that a more economical selection of the radiator required to do the specified cooling job may be made by the radiator manufacturer. It is often more economical to use 1-pass cross flow than 2-pass counter flow, especially if a large flow of water is to be cooled. Likewise, it may be more economical to use three rows deep rather than four, or to use six rows deep rather than five. The outside radiator dimensions should not be specified either unless space is at a premium, or the amount of space available rigidly fixed.

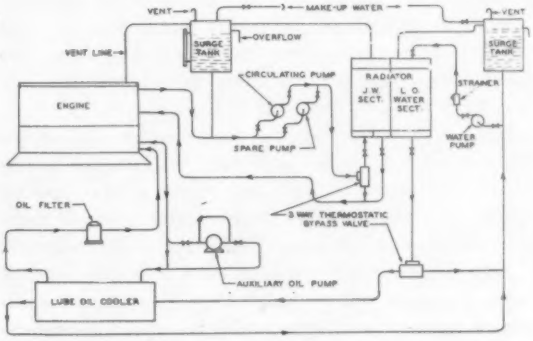
Allowable pressure drop through the radiator is often specified. In general, higher pressure drop will allow higher velocity inside the tubes, which means better heat



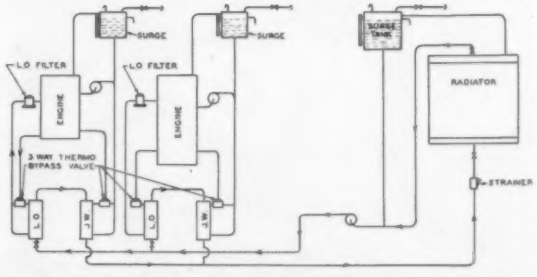
Single water stream from engine goes through radiator. Temperature is controlled by bypass valve with cooling adequate to compensate for heat picked up in cooling lube oil and still permit proper entry temperature at engine. Lube oil has own control.



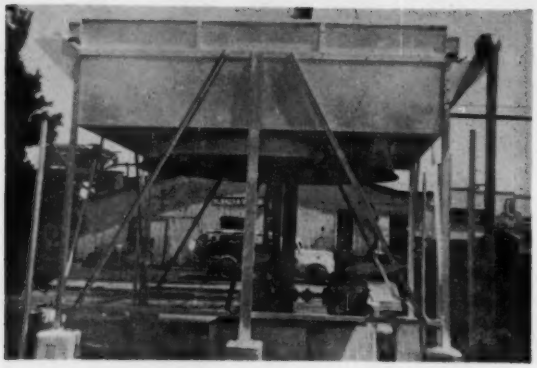
Two-section radiator core permits direct cooling of both oil and water. Separate thermostatic 3-way bypass valves control the cooling effects. Lube oil cores must be designed for higher operating pressures, generally specified at 100 psig at 200°F.



System with radiator split for cooling two water streams. Jacket water is cooled directly; second water circuit cools lube oil in a shell-and-tube type cooler. Each water circuit temperature is separately controlled by its 3-way bypass valve.



Where large radiator serves multiple engines, one water stream with separate shell-and-tube coolers can be used. Cooled water from header enters each engine's lube oil cooler, then jacket water cooler before entering return header. Each jacket water and lube oil circuit has its own thermostatic bypass control.



Horizontal core mounting as in this vertical air-discharge, forced-draft radiator is least affected by wind direction and facilitates freeze protection. Note fan's angle drive.

transfer and less cost. Usually a water pressure drop of 6 psi maximum should be reasonable, and an oil pressure drop of 13 psi.

Core Types & Tubes

There are two general radiator core types in common use. The flat or oval tube type has copper or brass tubes, and with copper fins solder-bonded to the tubes. This type is used on about 90% of the radiator-cooled internal combustion engines in the country. This is the most efficient type of water-to-air heat transfer surface in present use, and the cost in Btu per dollar expended is least. Its chief disadvantages are that it is suitable for only rather low water pressures, usually 35 psig operating pressure, and that the tubes are of comparatively thin metal to resist corrosion if it occurs.

However, the water pressure in an engine cooling system is nearly always below 35 psig. With regard to corrosion, bad water is the worst enemy of any cooling system. The answer is not thicker metal tubes, or more noble tube metal but proper inhibitive water treatment.

With proper water treatment even thin-wall flat-tube radiator sections will last indefinitely. Many have been in service from 13 to 20 years with no repair or replacement cost whatever. Conversely with no water treatment, or improper treatment, the thickest-wall round tube will not last long. I have seen some of these corroded through in less than two years.

Where water pressures higher than 35 psig are expected, or where somewhat heavier construction is desired, round-tube radiators are available in a great variety of materials, tube sizes, wall thicknesses, fin shapes, fin materials, fin spacings, and methods of attaching the fins to the tubes. This is a sort of jungle in which claims and counterclaims for various types of construction are rampant. We have made use of about every type of fin-and-tube construction presently available and have tested them in our Research Department. Our conclusions regarding round tube Radiators are as follows:

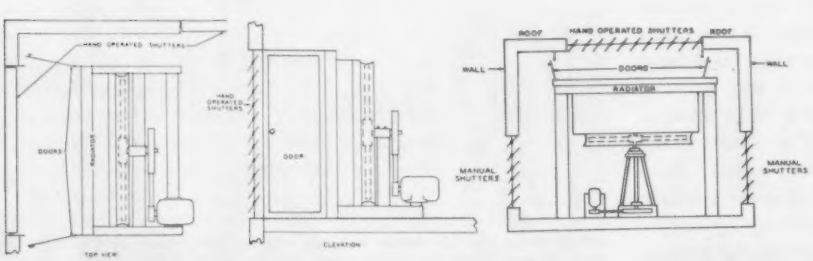
We think that tubes should be of Admiralty metal. Any tube diameter from ½-in OD to 1-in OD is satisfactory. Tube diameter should not be specified if the best radiator selection is desired since it will sometimes work out that ½-in OD is better, sometimes ⅝-in OD, and sometimes ¾-in, ⅞-in, or 1-in. Unless some very special reason is involved, tube diameter should be left open. It is usually best to specify that the tubes should be rolled into steel tanks or header plates, and that the end tanks should be of fabricated steel or of cast iron.

The design operating pressure should be specified. This should be as low as is consistent with the service intended in order to secure the best price. Usually 65 psig operating pressure with 100 psig test pressure is correct for engine jacket water. It is not usually advisable to specify the tube wall thickness. If the tubes must be rolled into a steel header plate or tank, this will automatically call for a rather thick tube capable of standing pressures far higher than needed. It should be specified that a drain connection be supplied on the bottom side of each end tank, and a vent connection on the top side of each tank.

Round tubes, finned on the air side fall into three general types. The oldest type has a strip fin helically wound on the tube. It is still used rather extensively, but may have a relatively high resistance to air flow and be comparatively inefficient. With a copper alloy tube, the best way to get a good, permanent bond between fin and tube is by using a copper fin, soldered to the tube.

When aluminum fins are used with a copper tube, there is no satisfactory method of soldering. When tension-wound they have been known to loosen under repeated cycles of high and low temperature.

A second type of helical-finned tube is made with the



Two types of interior radiator mountings—plan and elevation of vertical-core type and horizontal-core arrangement—with shutter arrangement for air flow control.

Induced-draft radiators with vertical cores, closure doors and vertical air discharge.

fins extruded from the tube. This gives a perfect tube and fin contact. A variation of this type is the bi-metallic tube, where there is an inner liner of copper alloy tube, and the fins are extruded from an outer tube of aluminum. The original bond between liner and outer sheath is not perfect to start with, and repeated temperature cycles tend to loosen the contact between the two metals still more.

The most widely used type of round tube, finned heat transfer surface is the "plate fin" type. The fins extend across many tubes making an exceedingly strong coil. The bond between fin and tube is usually entirely mechanical, although copper fins may be solder-bonded to the tubes. If the fin holes or collars are properly formed, however, and the tubes mechanically expanded into the holes no solder is necessary either with aluminum or copper fins. Solder actually hinders the flow of heat.

The usual method of manufacture employs a multiple step punch press operation to properly form the fin holes and collars a few thousandths of an inch larger than the outside diameter of the tubes. The tubes are then inserted through the fins and a hardened steel bullet forced through the tube expanding it possibly thirty thousandths of an inch. This gives a tight, permanent fin-to-tube bond which does not loosen up even under repeated temperature cycles. Aluminum fins on copper alloy tubes are successfully used in this type of construction.

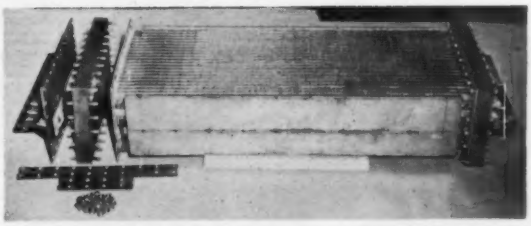
The helical-wound finned tubes are, of course, made as individual tubes, and have a somewhat questionable advantage over the plate finned type in that tubes may be individually removed and replaced. However, the plate finned type can also be cut up into individual tubes with rectangular fins, and the advantage of individual replacement secured, without sacrificing the benefits of perfect mechanical bond between tube and fins with either copper or aluminum fins.

For the direct lubricating oil cooling in a radiator, coils should be made of round tubes and should be specified for a service of 100 psig operating pressure and 150 psig test pressure. Since oil has a low heat transfer rate inside the tubes, it is a great advantage to use properly formed turbolators inside the tubes to prevent viscous flow, and to increase the heat transfer.

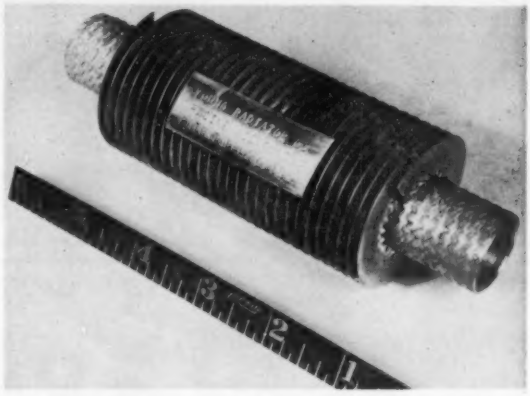
Fans

Fans for large radiators are of many materials, and of many types. For most applications satisfactory blade material may be aluminum, monel metal, stainless steel, plastic, or laminated wood pnenolic resin covered. All 54-in dia or larger fans should have adjustable-pitch blades. Fan blades should have airfoil section for efficiency, and no less than 4 blades should be used. With regard to speeds, the usual limiting factor is fan noise level.

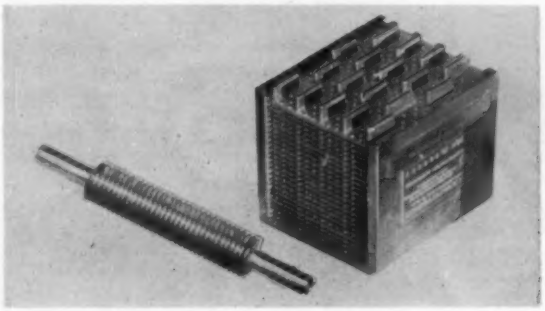
Tip speeds of about 13,000 fpm are usually acceptable. This will give a noise level of about 83 db (decibels) at 18-ft in front of the fan, or about 74 db at 50-ft. If the



Removable end-tanks and/or covers for easy inspection and cleaning of tubes are an important maintenance factor.



Extended area on the air-side is provided by a helically-wound, crimped and soldered strip fin attached to the tube.



A bi-metallic tube with inner copper alloy tube with fins extruded from outer tube of aluminum. A section of a plate-fin core where flat copper or brass tubes are used.

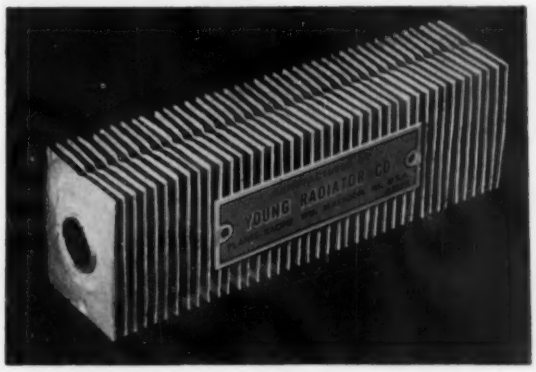
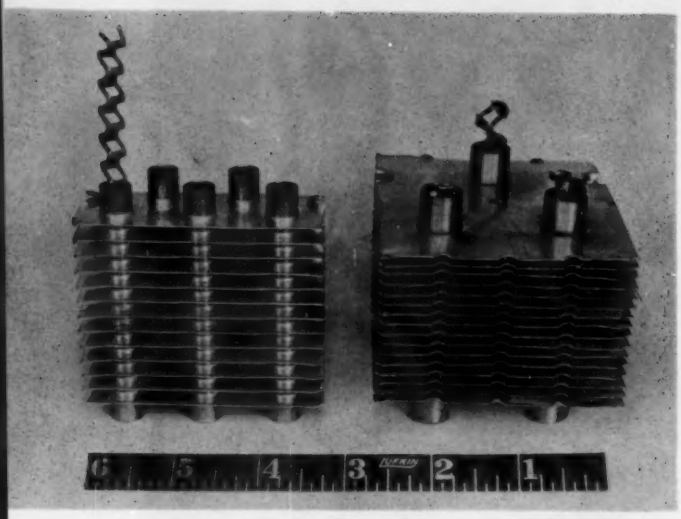
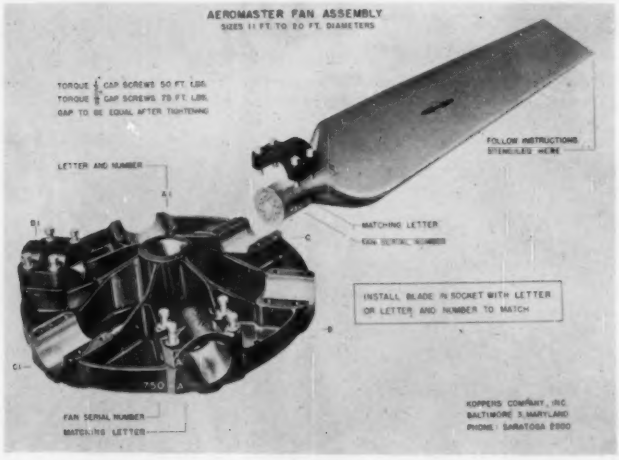


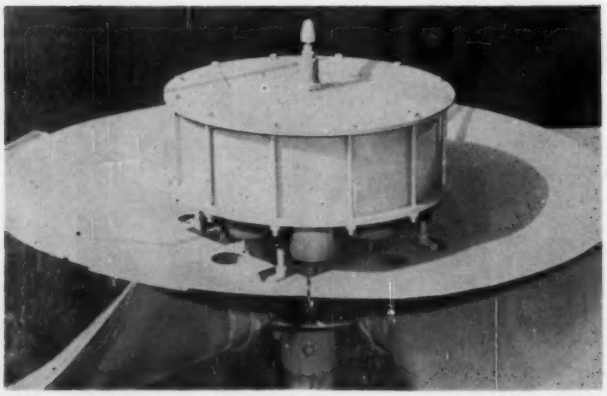
Plate-finned round tube with plates cut to secure the advantage of individual tube replacement when necessary.



Sections of plate-finned core for oil cooling using round tubes for higher operating pressure. Crimped inserts extending from tubes create turbulent oil flow to improve heat transfer rates.


AEROMASTER FAN ASSEMBLY
SIZES 11 FT. TO 20 FT. DIAMETERS
TORQUE 1/4 CAP SCREWS 50 FT. LBS.
TORQUE 5/16 CAP SCREWS 70 FT. LBS.
GAP TO BE EQUAL AFTER TIGHTENING
FOLLOW INSTRUCTIONS
LETTER AND NUMBER
MATCHING LETTER
INSTALL BLADE IN SOCKET WITH LETTER
OR LETTER AND NUMBER TO MATCH
FAN SERIAL NUMBER
MATCHING LETTER
KOPPERS COMPANY, INC.
BALTIMORE 3, MARYLAND
PHONE: SARATOGA 2000

Pitch of Aeromaster fan blades is manually adjustable. Blades are accurately made of laminated wood, then phenolic resin dipped.



A variable-pitch fan with pitch automatically controlled during operation through action of a thermostatic sensing element.

installation is in the middle of a town with residences or offices close by, tip speed should be about 10,000 fpm or less; 9000 fpm tip speed would mean a sound level of about 70 db at 18-ft or 61 db at 50-ft. Fans are available with automatic adjustable pitch which may be thermostatically controlled during operation. All fans should be adequately guarded.

For vertical radiators, fans are almost always belt-driven. Occasionally direct-drive from a slow speed motor, gear motor, or hydraulic motor is used. For horizontal radiators, the fan drive may be either through a right angle gear box, or by V-belts. Belt drive is most commonly used. Small diameter fans are often mounted directly on the output shaft of a slow speed electric motor. Direct drive from a slow speed motor is the simplest and most satisfactory, but is practical only for rather small fans. Gear motors are not usually considered satisfactory for such service.

With either right angle gear drive or belt drive, it is better to have the fan supported on a tripod with a thrust bearing at the top to carry the weight and thrust of the fan. In all cases it is advisable to have the fan carried by a separate structure from the main radiator frame. An electric motor usually drives the fan and may be either 1- or 2-speed.

Motors of 15 hp or over are usually 2-speed, while 10-hp or smaller are single-speed. If multiple fans and motors are used for a single radiator, they are usually single-speed. The reason for 2-speed or multiple motors is to offer a more flexible unit, and to save on fan power. A radiator must be designed for full engine load with summer air temperatures, but this full capacity may be needed only 10% of the year or less. Most of the time the fans can operate at half speed, and may be shut off entirely during part of the winter. Fans may also be driven by multicylinder internal combustion engines, steam turbines, hydraulic motors, or by shafting from the engine to be cooled.

Auxiliary Equipment

Auxiliary equipment for radiators is often supplied. Such equipment may consist of: shutters, either manual or automatic; core guard screens; walkways and ladders; motor starters and controls. Shutters are used primarily for two reasons.

First, to retard the flow of air through the radiator core in order to hinder freezing of the water in the radiator during cold weather. Second, to control the temperature of two or more separate fluids being cooled in the radiator at the same time by a single fan.

In the first case the shutters may be manually controlled or automatically controlled by a thermostat with its sensitive element in the water line from the radiator, and set to close the shutters when the water temperature from the radiator drops to about 10°F. below the design leaving temperature.

In the second case a separate set of shutters is installed over each separate service and each set is auto-

matically controlled by the temperature of the fluid for that particular service. In such cases the fan is usually controlled manually.

Core guard screens are usually used over the flat tube type of radiator core on a horizontal coil radiator to prevent damage to the core from hail or other falling objects; also screens are sometimes used over round tube cores.

Walkways along the top of a horizontal core unit are sometimes provided for easy service to the cooling coils, but such service is so seldom that the extra expense of permanent walkways and ladders is not justified.

Operational Considerations

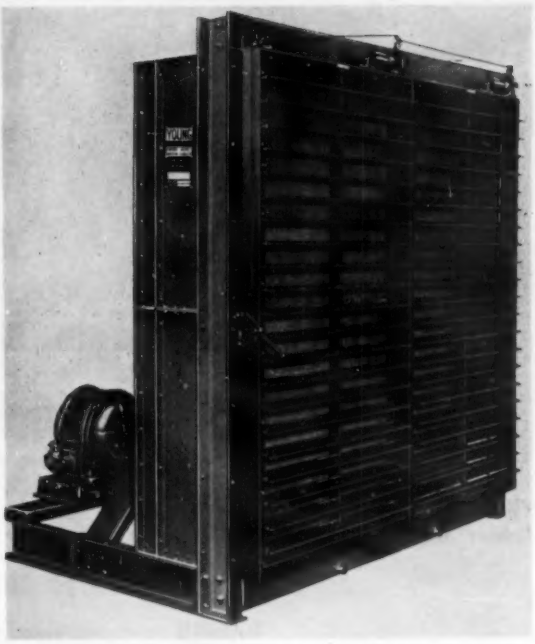
Water cooling radiators are, of course, subject to the hazard of winter freeze-up. This is an installational and operational problem since there is nothing the manufacturer can build into the radiator to prevent freezing. There are only three methods of preventing water from freezing in a radiator in cold weather: (1) use an antifreeze solution in the water; (2) keep the radiator hot at all times; (3) drain out the water.

From the standpoint of radiator operation, the first method is the most desirable, though rather expensive, and with other possible complications. The antifreeze should be removed for summer operation, as it is not as good as plain water for a cooling and heat transfer medium.

If there is sufficient engine load at all times and shutters are used on the radiator, it is possible to prevent freezing even in the coldest weather with the radiator outdoors. For extremely light engine loads it may be necessary to place the radiator indoors, with shutters to close off the outside openings and to cause recirculation of hot air.

When the engine is shut down completely, it is necessary to drain an outdoor radiator unless antifreeze is used. Where multiple engines are cooled by multiple radiators with proper manifolding and valving of the water flow, some of the radiators may be shut down and drained during the winter season.

A radiator is most likely to freeze after drainage when it is first placed to use. The mass of metal in the radiator may be very cold. If a small trickle of water from a partially opened by-pass valve enters the cold radiator, it is likely to freeze before it gets through the tubes.

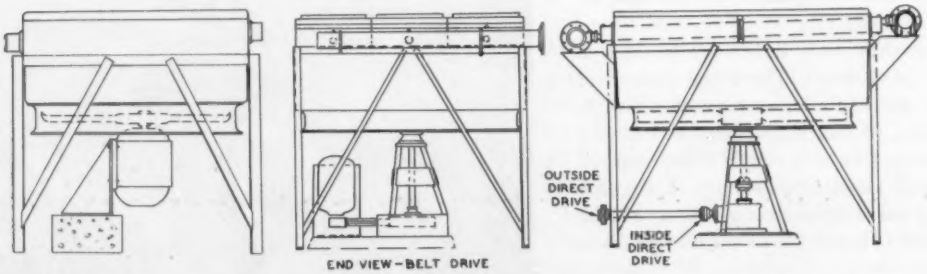


Shutters are used to control air flow by hindering its passage through the radiator. This controls cooling effect. When two fluids are cooled in separate sections of radiator having a single fan, two shutters permit independent temperature control.

Water should be admitted to the radiator in full flow and at high temperature.

For the control of corrosion inside the tubes of a radiator, a proper water treatment should be used. Since every installation will present a different water treatment problem, it is advisable for the operator to contract with a reputable water treating company to test the water at frequent intervals and recommend the proper treatment. For copper alloy tubes the water should be slightly alkaline with a pH of not less than 8.

External corrosion of the fins from elements in the atmosphere is sometimes experienced. The most common of these is H_2S in the sour gas oil field areas, and salt corrosion near the sea coast. For H_2S_x corrosion either aluminum or Admiralty metal fins are indicated. For salt corrosion Admiralty metal tubes and fins should be used.



Fan drive may be direct by use of a slow-speed motor (left) through belt drive (center), or through an angle drive.

Paper Liners Ease Centrifuge Cleaning

With paper bowl liner, normally messy job is made cleaner and faster. Just follow the six steps.

USE of paper liners in bowls applies only to those which have been balanced by grinding. It will not work with bowls balanced by the addition of weights, as the paper liner will not lie smoothly within the bowl shell in such cases.

Since all De Laval bowls can now be balanced by grinding, many operators owning the balanced-weight bowls may wish to specify rebalancing by grinding the next time they send their bowls in for repair.

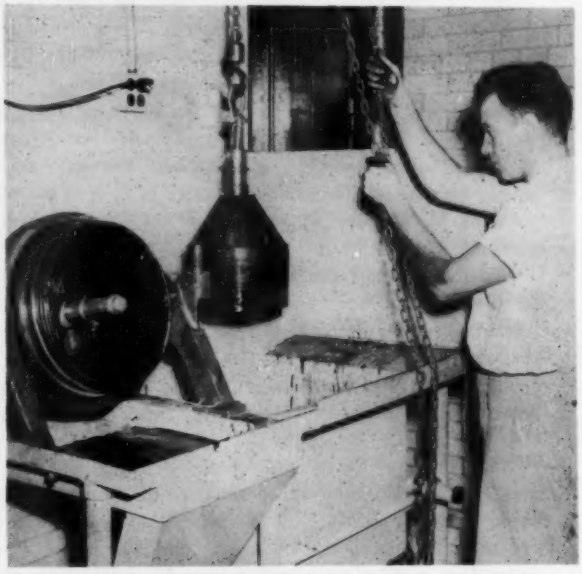
This procedure of utilizing liners is particularly effective in the case where oils are heavily charged with dirt. (Heavy diesel fuel or block test oil.)

By using a paper liner, a bowl can be completely cleaned and put back in service in a matter of a few minutes. It is seldom, if ever, necessary to clean the discs individually, or even to remove the bowl parts from the tubular shaft over which they fit.

The three occasions when each disc should be cleaned are (1) when some special circumstance has allowed dirt to dry on the discs so tightly that the solvent will not loosen it and (2) when special products are to be separated or (3) when the same machine is utilized to separate different products and special attention must be given to avoiding contamination.

As the photographs show, very little work is required to clean a bowl by this method. The actual process of removing the heavy particles of dirt from the bowl is done by a combination of centrifugal force and solvent solution. A bowl cleaned by this simple 6-step method will be almost perfectly clean. The quantity of dirt that will remain in the bowl after such a cleaning will be small and, will be safely outside the zone where purification takes place.

Step 1 Stop unit and drain bowl. Don't open covers. Start unit without admitting fluid. With bowl up to speed, apply brakes.



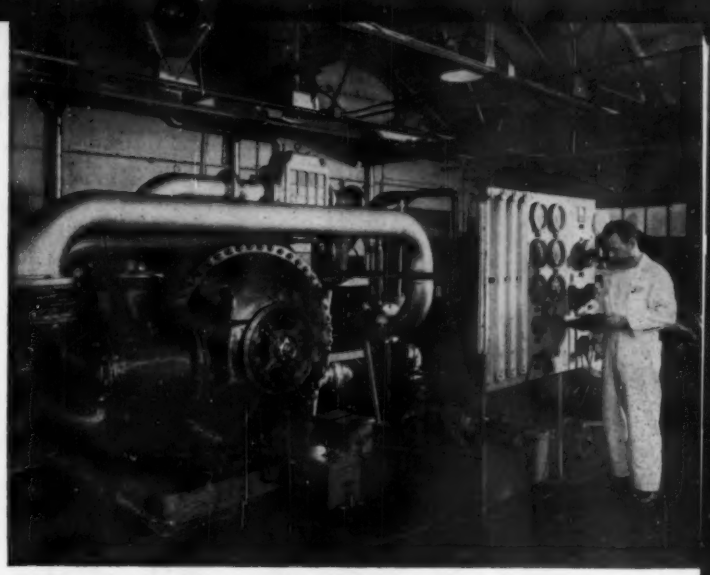
Step 3 Disassemble, removing coupling ring, bowl top and top disc. Remove tubular shaft and disc unit, placing it in solvent.

Step 5 Insert new liner in bowl using scotch tape to hold the overlap in position. Replace the solvent-wet disc assembly.

tep 2 Let bowl stop and drain again. Open cover and remove in-er hopper. Lift out bowl assembly, moving it to cleaning vise.

tep 4 Tilt bowl and using spatula, loosen paper liner. Pull ut the liner and along with it, all the accumulated bowl cake.

tep 6 Reassemble bowl. Bring unit up to speed. Solvent-wet irt is thrown from discs. Establish water seal, turn on oil.



Measuring performance and checking characteristics of one centrifugal compressor of Cooper-Bessemer's new line of such units.

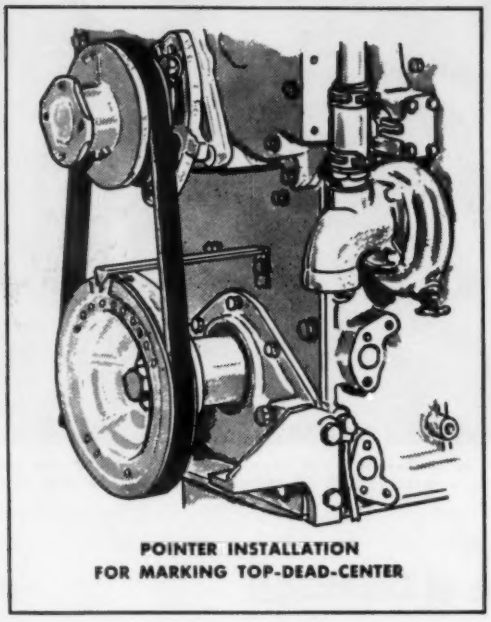
Line of Centrifugal Compressors Added by Cooper-Bessemer

RANGING in capacity from 500 to 65,000 cfm, the new centrifugal compressor line is designed to augment C-B's reciprocating compressors now serving the petroleum, gas and processing industries. Various units of the new line are reported to be in service already.

Immediate markets outside of the petroleum and petro-chemical industries include the fast-growing field of air conditioning for which the centrifugal compressor is highly practical, according to Mr. Stanley E. Johnson, Vice President and Director of Sales for C-B. Considerable progress has already been made in this field and prototypes of centrifugal compressors for refrigerators have already been designed, he said.

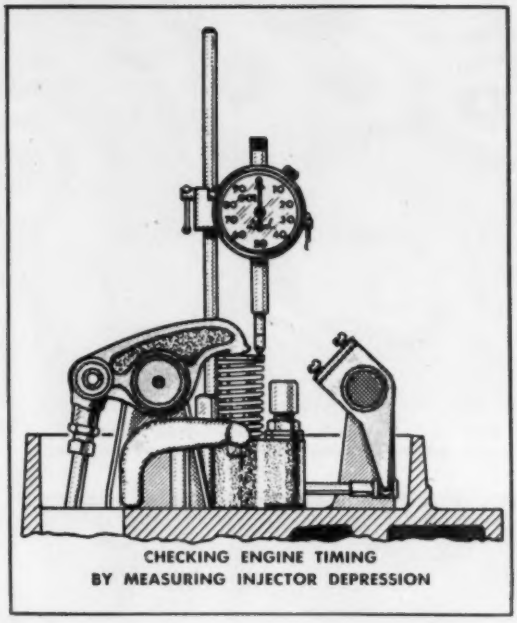
Intensive research work on Cooper-Bessemer's centrifugal compressors began approximately 10 years ago. The first development was a turbocharger for use on their 4-cycle gas engines capable of developing up to 5000 hp. The work was headed by Ralph L. Boyer, Vice President and Chief Engineer, and research was put under the direct supervision of John Fullemann, Swiss-born and -educated scientist. Mr. Fullemann joined Cooper-Bessemer's engineering staff in 1948, coming directly from the Buchi Syndicate, where he was assistant to Dr. Alfred Buchi. The Buchi Syndicate is credited with developing the first practical turbocharger.

Cooper-Bessemer is currently building its centrifugal compressors at its factory in Mount Vernon, Ohio, where its line of turbochargers is also manufactured.



POINTER INSTALLATION
FOR MARKING TOP-DEAD-CENTER

Figure 1



CHECKING ENGINE TIMING
BY MEASURING INJECTOR DEPRESSION

Figure 2

Revised Timing Procedure....

GM Series 71 Engines

Greater accuracy is the result of the revised procedure for timing the "71" engine. Now, you check injector and piston depression with a dial indicator.

A REVISED method for checking the timing of Series 71 engines has been developed. With the new method, a dial indicator is used to check piston and injector depression.

When it is suspected that an engine is out-of-time because of improper functioning or poor performance, this revised method may be easily applied inasmuch as all readings are taken "on top" of the engine.

Access to the vibration damper, or crankshaft pulley, to mark the top-dead-center position of the selected piston; and, to the front end of the crankshaft, or flywheel for barring the engine over is necessary in performing the timing check.

The "tools" required to mark this check are a dial indicator and a helper to bar-over the engine, thus permitting the mechanic to make careful observation of the indicator readings during the location of the top-dead-center position, and while accurately measuring injector depression.

Procedure

1. Remove the cylinder head cover.

2. Select any cylinder for the "timing" check—it is suggested that a cylinder adjacent to one of the cylinder head cover studs be chosen inasmuch as the stud may be used for mounting a dial indicator.

3. Remove the injector fuel jumper lines (at the cylinder selected) and install shipping caps on injector fuel fittings; make sure that the valve and injector rocker arms are all in the "up" position, then remove the rocker shaft bracket bolts, and swing the rocker arm assemblies back out of the way. Remove the injector assembly.

4. Carefully place (do not drop) a welding rod approximately 12-in long through the injector hole and on top of the piston. With the throttle in the "no-fuel" position, bar the crankshaft slowly in the direction of rotation, and stop barring when the rod reaches the end of its upward travel. Remove the welding rod and

bar the crankshaft opposite the direction of rotation between 1/16 and 1/8 of a turn.

5. Select a dial indicator having .001-in graduations and with a spindle movement of at least 1-in. Use suitable mounting attachments for the indicator so that it can be mounted over the injector hole in the cylinder head. Provide an extension for the spindle of the indicator. The extension must be long enough to contact the piston as it approaches its upper position.

6. Mount the indicator over the injector hole and tighten mountings sufficiently to hold the indicator rigid. The mounting leg may be threaded into the cover stud; or, the stud may be removed from the cylinder head and the leg threaded into its tapped hole, depending upon the length of the rod used in making-up the mounting attachments. Make sure the spindle extension is free in the injector hole, does not bind, and is free to travel its full 1-in movement.

7. Provide a suitable pointer and attach it to the crankshaft front cover or engine front end plate as depicted in Figure 1. Pointer should extend over the vibration damper, or crankshaft pulley, whichever is used.

8. Bar the crankshaft in the direction of rotation slowly until the hand on the dial indicator just stops moving.

9. Bar the crankshaft in the direction of rotation until the indicator hand just starts to move. Reset dial to "0." Continue barring slowly until indicator reading is .010-in—then stop turning.

10. Scribe a line on the damper (or crankshaft pulley) in line with the end of the pointer.

11. Bar crankshaft opposite the direction of rotation slowly until the hand on the dial indicator just stops moving.

12. Bar the crankshaft opposite the direction of rotation until the indicator hand just starts to move. Reset dial to "0." Continue barring slowly until indicator reading is 0.010-in—then stop turning.

13. Scribe a second line on the vibration damper (or crankshaft pulley) in the same manner as in Step 10.

14. Scribe a third line half-way between the first two lines. This is positive TDC. The three scribed lines are shown on the crankshaft pulley in Fig. 1. Remove the indicator from the engine.

15. Intall the injector assembly. Swing the injector and valve rocker arms back into position, install rocker arm brackets and tighten bolts to proper torque. Lash the exhaust valves and time the injector. Bar the engine until the exhaust valves in the selected cylinder are open.

16. Install the dial indicator once again so that the spindle of the indicator rests on top of the injector follower, (Fig. 2.) Set indicator dial to "0." Bar the crankshaft slowly in the direction of rotation, and stop when TDC mark on the vibration damper or crankshaft pulley lines up with the pointer.

17. Note the reading on the dial indicator and compare with the following table:

—if the indicator reading is 0.223-in to 0.233-in, the engine is in time,

—if the indicator reading is 0.188-in to 0.204-in, timing is one tooth retarded,

—if the indicator reading is 0.249-in to 0.257-in, timing is one tooth advanced.

After completing the timing check, remove the dial indicator; remove shipping caps from injector fuel fittings, and install the injector fuel jumper lines, making sure that they are tightened only enough to prevent any leaks; install the cylinder head cover; and, remove the pointer attached to the front of the engine.

What Do You Know!

Here are some questions to test your general knowledge of the diesel field. Make your selections, then turn to Page 116 to check them.

1. "Capacity", as applied to a given fluid coupling, refers to which of the following?
   a. Amount of oil in the fluid circuit
   b. Torque that can be transmitted
   c. Horsepower range that can be handled

2. Losses within a fluid coupling show up in which two of the following ways?
   a. Reduced output shaft rpm
   b. Reduced torque transmission
   c. As heat in the oil
   d. Erosion of the blading

3. In hydraulic torque converter operation, torque multiplication is highest when which one of the following conditions exists?
   a. When turbine is stalled
   b. When turbine is close to pump speed
   c. Same over full range of operation

4. Hydraulic torque converters will operate equally as well in either direction.
   a. True b. False

5. Some turbocharged engines can maintain full sea level ratings for at least up to 5000-ft altitudes. Despite reduced air density, this is possible because:
   a. Turbocharger speeds up and pumps more air at the lower density
   b. Original excess air is sufficient for operation up to this altitude.
   c. Exhaust energy increases at the higher altitude, pumping more air

6. The only way to check camshaft timing accurately is to examine gear match marks.
   a. True b. False

7. In radiator-type coolers, forced-draft fans are usually most desirable. Which one feature does not apply?
   a. Improved heat transfer
   b. Maximum air turbulence
   c. Fan more efficient
   d. Velocity through core more uniform

8. A plate-fin radiator core with regular flat tubes would not be used for lube oil cooling because
   a. Flat tubes restrict oil flow excessively
   b. Generally inadequate for lube oil pressures
   c. Flat tubes create a turbulent oil flow
   d. Flat tubes create a laminar oil flow

Straight from the Tool Box

This is YOUR Department. Pass along your ideas to the other fellow. Send items to the Editor, preferably with a picture or sketch. Contributors will receive $10.00 for each item upon publication.

Pulling Stubborn Liners

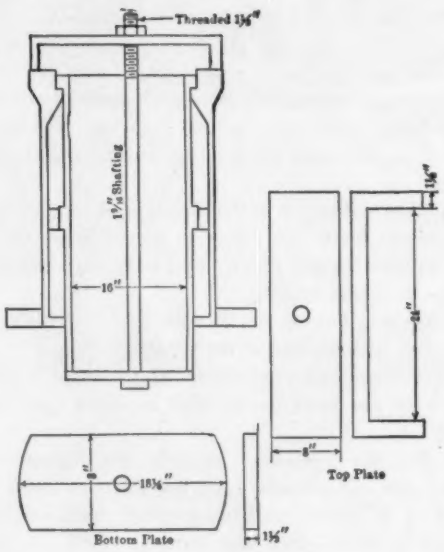
E. F. BOYACK, FT. LAUDERDALE, FLA.—DIESEL POWER gets better every issue and I look forward to each copy. I also received my copy of the DIESEL ENGINEERING HANDBOOK recently and it looks good to me. However, I would like to dispute a minor point.

When removing cylinder liners that are really frozen in place, you can pour all the rust remover, Gunk, fuel oil, vinegar, Coca Cola, or anything else over it; but it won't work. I've pulled a good many types and sizes of liners and have never seen this approach work with a really stubborn liner.

I have found that by using a setup similar to the one shown on Page 262 of the DIESEL ENGINEERING HANDBOOK [*puller with typical dimensions for a 16-in bore is shown —Editor*], the job can be done by using heat. On Page 264, a method of using a hoist for pulling while steam is admitted to the jackets to expand them and the liner is filled with water to keep it cool, is illustrated. With my method, I avoid all the mess of penetrants, water, and steam. Incidentally, I use a fine thread on the puller bolts instead of standard threads.

When the puller is in place, I put a good heavy strain on the bolts. Then by applying heat from an acetylene torch to the upper end of the liner and keeping the pulling bolts tight, the liner will have to pop.

The heat will cause expansion that will have to be toward the free end which is now the top of the liner. This method has never failed me yet and has been done with no damage to any other part of the engine. I just pulled 12 liners on a 14-in bore, salt-water-cooled engine, with this method.



There is nothing like using nature's laws to help you out. I'm sure that Mr. Boyack would want to caution users of this method to use a soft, neutral flame, and to try to keep temperatures even all around the liner. Many people, including myself, will argue the matter of shear strength of fine versus standard threads when heavy pulls are to be made; but in any case, it is a good practical idea to keep in mind—Editor.

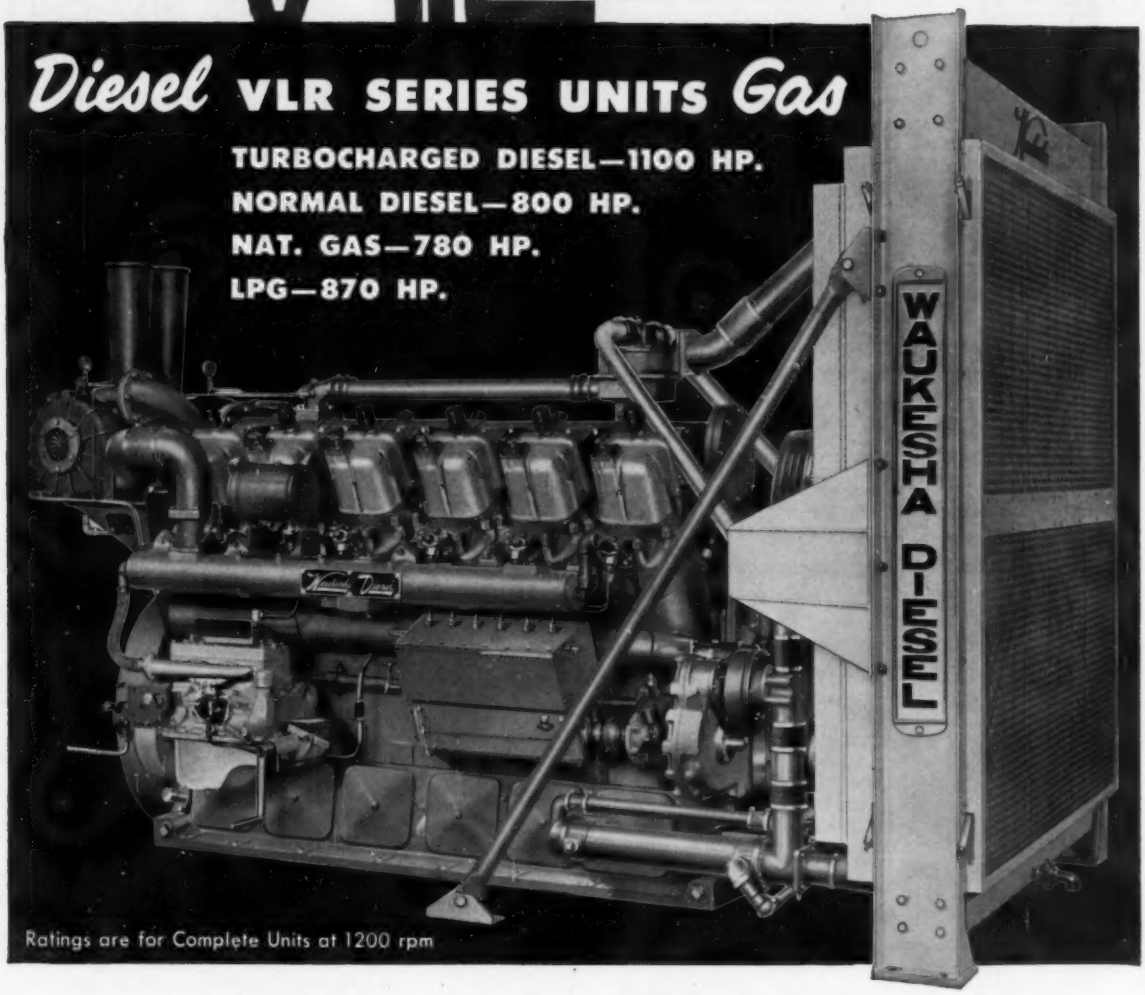
Salvaging Oil-Soaked Friction Facings

BENJAMIN ALVAREZ, JR., ANMOORE, W. VA.—Sometimes we run into clutch discs, brake bands, or brake linings that have become saturated with fuel oil or engine oil due to a bad oil seal or other leak. Of course, these won't do their job in this condition. When they are not worn sufficiently to be replaced or when replacements are not immediately available, they can be salvaged. We have found that a thorough washing in carbon tetrachloride will remove the oil to the point where an otherwise useless part will work again. Gasoline and kerosene may help but are not anywhere nearly as good as carbon tetrachloride.

new V-12 WAUKESHA

Diesel VLR SERIES UNITS *Gas*

TURBOCHARGED DIESEL—1100 HP.
NORMAL DIESEL—800 HP.
NAT. GAS—780 HP.
LPG—870 HP.



Ratings are for Complete Units at 1200 rpm

This powerful turbo-supercharged Waukesha is a twelve-cylinder, 60-degree vee, even firing, four-cycle, solid injection, overhead valve, compression ignition Diesel, of 8½-inch bore and stroke and 5788 cubic inch displacement. The connecting rod arrangement is of the side-by-side type; opposing pistons operating from a single wide-area crankpin.

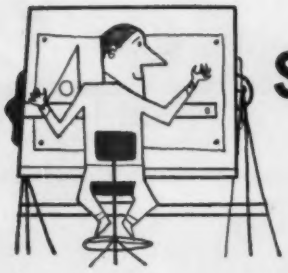
The turbocharged Diesel unit shown above develops approximately 1100 hp at 1200 rpm with radiator, fan, and air cleaners. Without turbocharging, the normal Diesel complete unit maximum rating is 800 hp. The propane-butane model of this V-12 series develops 870 hp. Bare engine ratings of all models are higher. Response to throttle and load requirements is quick and smooth, with a fast surge of reserve power for emergency and overload demands.

Tremendously powerful, remarkably rugged, this V-12 engine is designed for simplicity and reliability. Major parts are interchangeable between right and left cylinder banks. Main and rod bearings are easily accessible. Strength, precision and balance are built into all elements of the power train, from pistons to flywheel. Supporting members are designed for extreme rigidity and perfect alignment of moving parts.

Send for Illustrated Bulletins 1663 (turbocharged)—1664 (normal Diesel)—1656 (gas).

270

WAUKESHA MOTOR COMPANY, WAUKESHA, WISCONSIN • NEW YORK • TULSA • LOS ANGELES



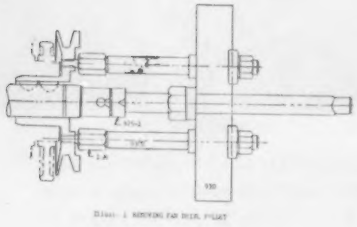
service section

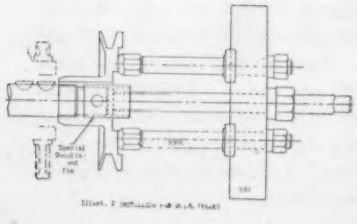
Recent engine and equipment modifications, procedures and recommendations straight from the different manufacturers to you

INTERNATIONAL HARVESTER —Fan Drive Pulley Puller and Installing Tool—6, 9, 14, and 14A Series Engines . . . .

A service tool is now available for removing (see illustration 1) and installing (see illustration 2) the fan drive pulleys on the Series 6, 9, 14, and 14A International Harvester engines. This tool consists of two special items, a coupling and pin.

The part number for these two items is 1 020 322 R91. The coupling and pin are used in conjunction with an OTC-938 push puller using their 930-E legs, two male plug adapters, 15 M (⅜-16 male and ⅝-18 female), and one 625-1 shaft protector. Part number for the complete tool is 1 020 323 R91. The tool may be ordered from the Sterling Products Company, 121 North Jefferson Street, Chicago 6, Illinois.





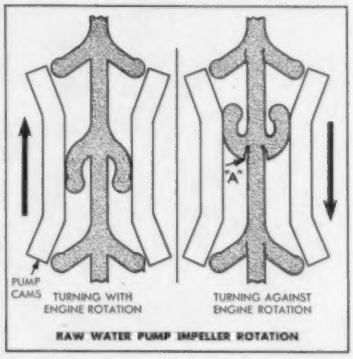
GM—Barring-Over Marine Engine Units — Series "110" engines . . . .

When making engine adjustments, especially the lashing of exhaust valves and timing the injectors, servicing personnel should not bar the engine in a direction opposite to the normal direction of engine rotation.

The precaution is of the utmost importance and should be adhered to if damage to the vanes of the rubber impeller in the raw water pump is to be prevented. As can be seen in the drawing, the vanes are mounted at a definite angle to the center line of the impeller diameter, thus necessitating that the impeller be rotated in only one direction to conform to the vane angle as well as producing efficient pumping action.

If the engine is "barred-over" opposite to it's normal rotation, the impeller blades will be bent backwards from their normal position as they come in contact with the cam wearplates and thus become ruptured, and ultimately broken, as shown at "A".

Whenever a raw water pump is disassembled for servicing, all component parts of the pump must be thoroughly cleaned, then inspected for signs of wear. Special attention must be given to the impeller for determining if any of the vanes have been ruptured at the center web as a result of the engine being "barred-over" in the wrong direction.



RAW WATER PUMP IMPELLER ROTATION

★ ★ ★ ★ ★

EMD — Cylinder Head Installation — All Engines . . . .

Information contained in previous Engine Manuals, referring to the use of green soap to be applied in firing face holes of cylinder heads during installation, was inadvertently omitted from the 252C Manual and will be included in the next edition.

We wish to again remind all concerned that the practice of applying a small quantity of green soap in the bottom of all water and stud holes just prior to installation is recommended and followed by EMD on both new and rebuilt engines. This recommendation should be followed in the field at the time of *any* cylinder head installation.

news of our industry

Battling the Sea

Because of the many oil wells constantly pumping at its southern end, Terminal Island, near Long Beach, Cal., has been sinking into the sea at the rate of one foot per year. Now after 20 years, warehouses, docks and other installations which were once high above the water are awash during high tides.

The Long Beach Harbor Dept. has instituted a project to raise the docks and warehouses 20 feet and put the oil well pumps on raised platforms. The work is being paid for from an assessment placed on each barrel of oil drawn from the area, aptly named a "sinking fund".

Progress is shown here at Pier C, where Guy F. Atkinson Co. has installed the concrete work for the pier. Using an International TD-24 crawler, contractor Watson E. Jarrett is spreading and compacting 250,000 tons of sand to fill in the area between Pier C and Pier D to the north. The sand is trucked in from six miles away.

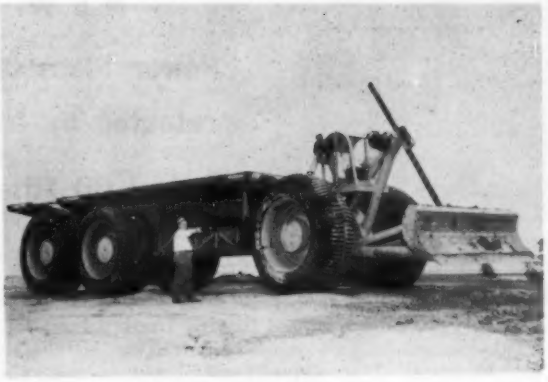
Jungle Destroyer

Designed to uproot heavy trees and underbrush with pushbutton ease, this 6-wheel Goliath is said to have three times the wallop of an M-24 tank, yet to be so light on its feet that it can roll over a pocket watch without damaging it. The wheels each measure 4-ft wide and 10-ft tall. R. G. LeTourneau, Inc., its designer, calls it a "Tree Crasher", and is having it delivered to the Florida-Georgia coastal area where it will be kept busy for the next six months in major land-clearing work.

In operation the machine looks like a magnified beetle. The operator perches in a balcony-high cab and fingers electric switches to maneuver it directly into a large-size tree with the blade of the machine raised about 10 ft in the air. The tree bends, strains, then lifts its own roots as it crashes to the ground. For medium-size trees, the machine moves in with lowered blade, uprooting and carrying them away in one continuous motion.

To test its power during try-outs, the machine was made to push a pile of metal weights equivalent to 75 autos. The task is said to have been done smoothly and quietly. Power is supplied individually for each wheel by electric motor and gear reduction within each wheel rim. The motors are driven by generators, which in turn are driven by two diesels near the center of the unit.

The tires of the 120,000-lb vehicle operate with air pressures as low as 5 lb, so that actual per-sq-in weight of the machine upon the ground is about the same as that of a walking man. This degree of flotation suits it for swampy or sandy grounds. The top of the crasher is a 39-ft long by 11-ft wide platform which, LeTourneau says, is capable of supporting more than 200,000 lb.



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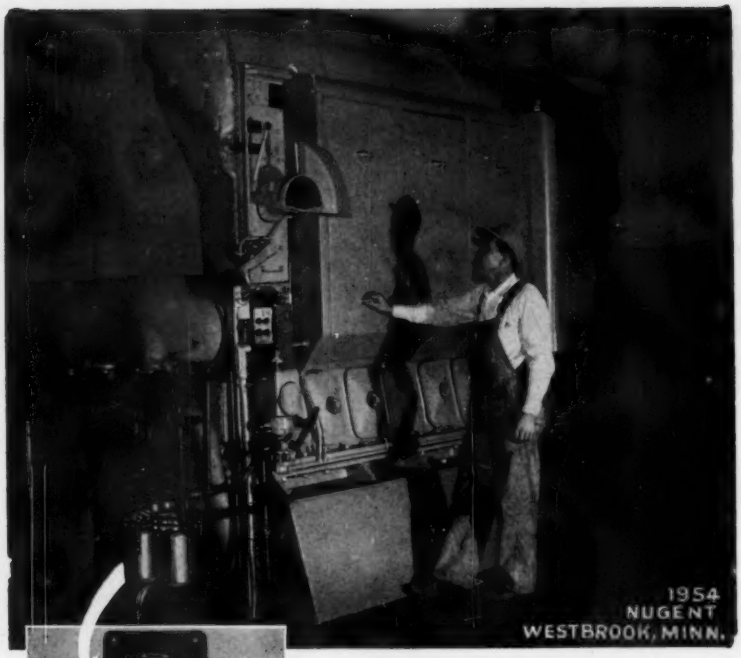

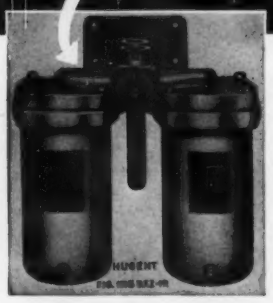

N E W

Power Plant Diesel protected by Nugent Fuel Oil Filters

A power plant can't afford "second best" when it comes to diesel fuel oil filters. *That's why* leading diesel manufacturers install Nugent Fuel Oil Filters on nearly every engine slated for power plant service. *That's why* a Nugent Duplex Fuel Oil Filter was included as original equipment on the 960 HP Fairbanks Morse recently installed for municipal power service at Westbrook, Minnesota.

Nugent Duplex Fuel Oil Filters of this type utilize an inexpensive bag type cartridge that actually removes 99.8% of all solid foreign material from the fuel oil. The cartridge lasts a long time, is easy to replace and presents 20 times more filtering area than any other charge of comparable size. The filter covers, valve manifold and bracket is one casting. Units can be operated separately or in parallel and slow manipulation of the valves will not cause stoppage or high pressure.

You, too, can't afford "second best" when it comes to fuel or lube oil filtering. So, take a tip from leading diesel manufacturers and investigate the possibilities of Nugent Filtering units for your own equipment.

NUGENT TRADE MARK

Wm. W. Nugent & Co., Inc.

417 N. Hermitage Ave. CHICAGO 22, ILLINOIS

OIL FILTERS, OILING AND FILTERING SYSTEMS, TELESCOPIC OILERS, OILING DEVICES, SIGHT FEED VALVES, FLOW INDICATORS

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news of our industry

Alco Locomotives for Pakistan

Nineteen diesel locomotives will be delivered to the North Western Railways of Pakistan by Alco Products, Inc. Consisting of two of the company's specially designed "world" locomotives and 17 1600-hp road switchers, the order is valued at more than $2,900,000. Last of the delivery is expected by August.

Shown here, Alco carpenters are putting the finishing packaging touches on two of the units for shipment. Because Pakistan has one of the widest track gauges in the world (5 ft 9 in), the units are unable to travel on U.S. rails and have to be mounted on flatcars for shipment to dockside.

Auburn Contracts Worthington

The city of Auburn, Nebr., has given Worthington Corp. a contract for a 12-cyl, 2141-kw dual-fuel unit. It will be the first 12-cyl Vee dual-fuel in Worthington's new line of high pressure turbocharged engines. This and a 16-cyl Vee, largest of the company's SW-14 line, develop twice as much power as its present diesels of the same weight and dimensions which have previously been built for similar service.

Pennsy Orders 50 Switchers

The Electro-Motive Div. of General Motors Corp. has received an order for 50 all-purpose diesel-electric road switching locomotives from the Pennsylvania Railroad. The 1750-hp units, costing $9,400,000, will be used for both road freight and yard switching and will replace 66 steam locomotives. They will be fitted for multiple operation. When delivered, the road's diesel fleet will consist of 1476 locomotives made up of 2034 units totaling 2,811,770 horsepower.

news of our industry

Deutz Opens U.S. Sales Drive

Aimed at expanding the use of its diesel equipment in the U.S., Klockner-Humboldt-Deutz, Ag, 90-year-old builder of diesels in Germany, has reorganized its sales and service branch, the Diesel Energy Corp., in New York. Importation and sale of the German air-cooled diesel engines will be a major concentration. Another important objective is establishment of production facilities in this country.

The German firm believes prime new fields for further dieselization exist in construction and irrigation equipment and in stationary power uses. They also indicate there is special need for mobile power in radar screening and radio beams for navigation aids in remote areas. Continuing automation will also call for heavy diesel application.

The plans for production in this country were revealed to be still in preliminary stages. An essential feature of this will be formation of a partnership with an established American company. The aim is to get into operation by the end of next year.

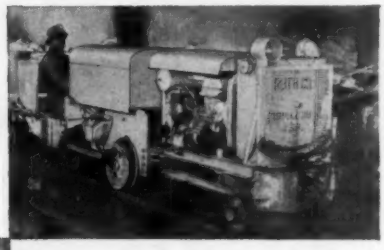
Deutz began work on air-cooled diesels in 1935 and came out with its first truck engine in 1942, a 70-hp unit. More than 100,000 of the firm's diesels are now in operation in the world, built in 1- to 12-cyl sizes and ranging from 8 to 250 bhp.

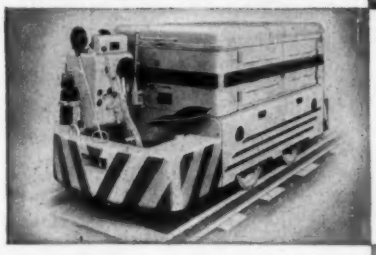
Diesel-Electrics Haul Coal

In the lower anthracite fields of Pennsylvania, six new General Electric Co. diesel-electric locomotives are transporting coal from the mine to the preparation plant of the Panther Valley Coal Co., replacing the run of old steamers. They are expected to result in considerable savings in transportation costs.

Three of the units are 80-tonners of 550-hp each, and haul the coal a distance of 4 miles up heavy grades. The other three are 25-tonners rated 150-hp each, and perform general colliery servicing. The locomotives were delivered eight weeks after the order had been placed.

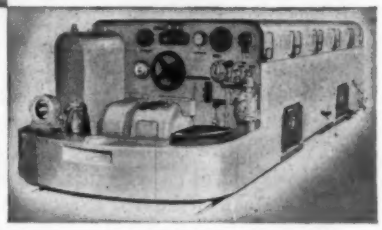
POWERED BY 2 CYL. HERCULES DIESEL, MODEL DIXD. This special Ruth Company diesel mine locomotive is one of 5 units in operation in a Tennessee zinc mine. These units pull an average of 16 loaded cars or 28 tons per trip to the mine shaft.





POWERED BY 4 CYL. HERCULES DIESEL, MODEL DOOD. This 5-ton Plymouth diesel locomotive is one of the most recent underground coal mining diesel locomotives to receive the approval of the Bureau of Mines under Schedule 22.

POWERED BY 6 CYL. HERCULES DIESEL, MODEL DWXD. This 10-ton National Mine Service Co. diesel locomotive was the first underground coal mining diesel locomotive to receive approval by the Bureau of Mines under Schedule 22. This was Approval No. 2201.



HERCULES *diesel* ENGINES

The above Hercules Diesel powered equipment has passed the most rigid tests of operations placed on any diesel engine.

The two-cylinder Hercules Diesel powered locomotive has passed the test of time. That is, it has successfully operated for over 6 years in an underground zinc mine. During that time it has not only provided "top-notch" operating economy but also has met safe operating standards set forth by the state and national mine authorities.

The four and six-cylinder Hercules Diesel powered coal mining locomotives have passed the tests established by the United States Bureau of Mines under Schedule No. 22. To illustrate the rigid specifications in Schedule No. 22, it was more than 6½ years after the schedule was established before any American manufacturer succeeded in developing a design that met all the requirements. This was the Hercules Diesel powered locomotive, illustrated above.

Specify, "Tested and Approved" Hercules Diesels for power and economy. Our sales engineers will be glad to assist you in solving your particular power problems. Drop us a letter, we'd be most happy to work with you—of course, there's no obligation on your part.

HERCULES ENGINES

HERCULES MOTORS CORPORATION

40 Years of Engines for Industry

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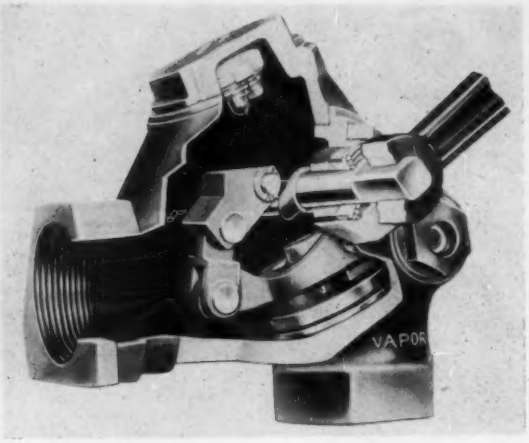
new products



Steam End Valve

A mechanical linkage inside this valve multiplies the lever pressure so that it can be opened easily against 250-lb pressure. Called Steam-Life End Valve No. 1127, it is used to control high pressure train line steam at the end of passenger cars and locomotives. The valve opens slowly at first and then increasingly faster, the stem rotating approximately 103 deg from closed to full open. A spring catch locks it open so it won't vibrate closed during rugged use.

To reduce wire draw, it has a replaceable disc and seat. For the steam heating system to work properly, a bleed valve allows a small amount of steam to escape. Vapor Heating Corp., 6420 W. Howard St., Chicago 31, Ill., has made up a kit of these new end valve parts to be installed in the older 2½-in 1117 and 1118 end valve bodies.

Multiple Outlet Gear Pump

Utilizing a single pair of special design gears to insure precision operation with minimum power consumption, this Model Z3U multiple outlet gear pump is available with from two to six outlets. An automatically controlled divider device enables each outlet to deliver an exact quantity of lubricant independent of the prevailing counter pressure.

Nathan Mfg. Corp., 45-02 Ditmars Blvd., Long Island City 5, N. Y., makes the pump in different sizes depending on the amount of lubricant required; and the delivery of the outlets can be equal or designed for a different quantity each. The illustrated pump is a 3-outlet model.

Pumps are also available with reversible drive for operation in both directions. This feature, accomplished without reversible valves or flaps, is said to insure proper operation when impure liquids are used. The pumps operate on a rotary drive with rotation direction controlled by an adjustable sleeve on the drive shaft.

Curb Pump Filter

Primarily designed for efficient removal of abrasive solids from diesel fuel, this dual filter pump is claimed to remove a high percentage of water as well. Purolator Products, Inc., Rahway, N. J., has designated it the PAG-25 D. It consists of a cast iron head and duplex aluminum cases containing two resin-impregnated paper elements. Both elements function simultaneously in parallel for a total filtration area of 1846 sq in.

This large filtration area is said to result in a high flow rate (25 gpm) and negligible pressure drop. Particles 15-20 microns and larger are strained. The filter's dual head has common 1-in inlet and outlet connections, an air vent, and four tapped holes if separate bracket mounting is necessary. Frequent periodic drainage of water and solids through the drain cocks below the cases is recommended.

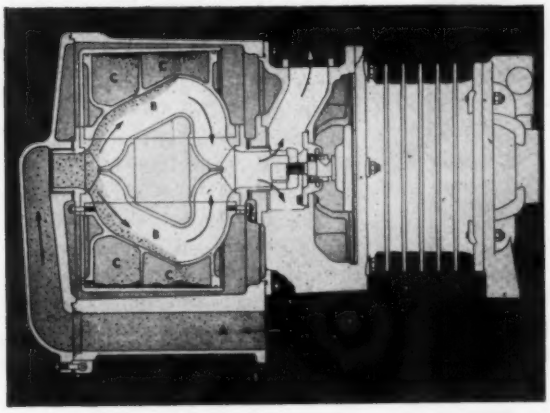
new products

EMD's New "Seprifuge"

"Seprifuge" is the name given by the Electro-Motive Div., General Motors Corp., La Grange, Ill., to its new full-flow centrifugal oil cleaner. The compact unit is designed to fit into present locomotive unit equipment racks. It can be easily installed on all locomotives now AC-equipped and is available as optional equipment on all new AC-equipped GM locomotives.

The cutaway shows the operation of this unit as well as its general construction. It consists of a housing with attached 5-hp AC motor, the rotor impeller with its outer shell, and the end-cover. Oil enters the Seprifuge at "A" under pressure and is channeled into 12 compartments in the spinning rotor "B". Top speed of the rotor is 3245 rpm, which produces the centrifugal force necessary to separate the dirt particles from the oil.

These dirt particles, heavier than the oil and larger



than the minimum oil film thickness, pass through openings into the collection chambers "C". Here they are trapped so that they cannot return into or contact the oil stream even when the machine is idle.

Capacity of the unit is 80 gpm when the locomotive is at idle and 265 gpm when it is at top speed. This is ample to permit full-flow cleaning and eliminates need for any bypass.

The single moving part, the rotor assembly, turns in oil-lubricated, sleeve-type bearings. With the cover removed, the rotor slides out for cleaning. Removal of the rotor shell gives direct access to the collection chambers.

A companion piece, also produced by EMD, is a cart-mounted, centrifugal-type impeller cleaner. Tests conducted on locomotives in service show that the Seprifuge has run as much as two months without requiring cleaning. Full details are available from the company.

it pays to know the EXACT RPM of your DIESEL ENGINE!

Get maximum efficiency
longer engine life

for BUSES • TRACTORS TRUCKS • BOATS

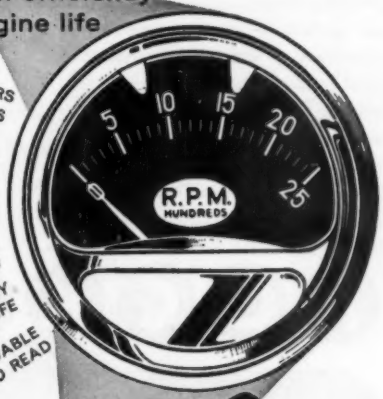
EASY TO INSTALL NO DRIVE CABLES

6, 12, or 24 VOLT ILLUMINATION

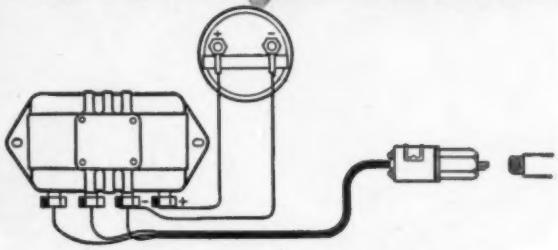
SELF-POWERED NO BATTERY DRAIN

HIGHEST ACCURACY LONGEST SERVICE LIFE

RUGGED, DEPENDABLE EASY TO READ



with new Sun MECHANICAL DRIVE ELECTRIC TACHOMETER!



Now, New Sun Mechanical Drive Electric Tachometer for diesel engines gives consistent, more accurate RPM readings for greater diesel efficiency and economy!

Operation is simple and foolproof. The new Sun Power Units are available for standard S.A.E. drive ratios—and S.A.E. mechanical drive outlets. Troublesome, long drive shafts are eliminated. The Sun Transmitter Unit attaches to any S.A.E. mechanical drive outlet where electrical impulses are picked up and transmitted to the Power Unit and then relayed to the "Tach" head in terms of RPM.

YOU GET GREATER ECONOMY . . . HIGHEST ACCURACY—with SUN! "Tach" Head has illuminated dial with adjustable arrows to indicate safe, economical RPM range! Jeweled D'Arsonval movement, Alnico magnet and rugged double bridge construction gives accuracy to 2% of full scale AT ALL ENGINE SPEEDS!

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new products

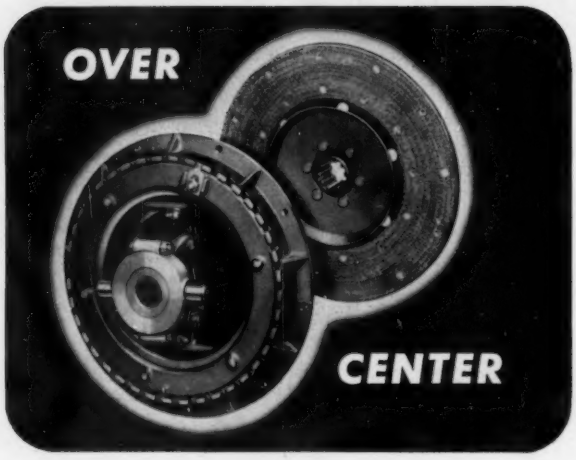
Explosive Gas Indicator

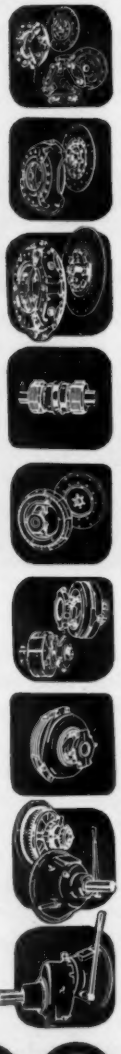
Slightly larger than a fountain pen, the Page Sensor pocket model gas indicator is intended for use wherever a quick spot check for combustible gases or vapors is needed. Self-contained, it operates on two small pen-light batteries.

To use it, the operator removes the plastic case and depresses the light bulb which acts as a switch. When the switch is on, the bulb glows dimly. If there is a trace of gas or vapor, the light begins to flash intermittently. As concentration of combustibles increases, the flashing becomes more rapid until a steady bright light indicates the atmosphere is hazardous.

The new indicator is a joint introduction of Hogart Engineering Co., 1050 S. Olive St., Los Angeles, Cal., and Davis Emergency Equipment Co., 47 Halleck St., Newark, N. J.

ROCKFORD





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HIGH TORQUE
POSITIVE ENGAGEMENT
LARGE DRIVING AREA
SMOOTH RUNNING
INFREQUENT ADJUSTMENT
MINIMUM INERTIA

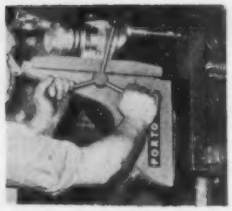
* Equally spaced, hardened and ground roller cams, bearing upon hard steel insets, exert heavy pressure evenly over the entire ROCKFORD Over-Center CLUTCH face — producing unusually high torque, for the clutch size and weight.

Send for This Handy Bulletin

Shows typical installations of ROCKFORD CLUTCHES and POWER TAKE-OFFS. Contains diagrams of unique applications. Furnishes capacity tables, dimensions and complete specifications.

ROCKFORD CLUTCH DIVISION BORG-WARNER
▲ 1301 18th. Avenue, Rockford, Illinois, U.S.A. ▲

CLUTCHES



Portable Magnetic Drill Press

Claimed to have drilling speed and accuracy equal to conventional drill presses, a lightweight drill press which locks in place by means of a magnetic base to permit operator to work without physical strain, has just come into the market. Called Portomag by its manufacturer, Lupear's Tool & Die Co., 32681 Northwestern Hwy., Farmington 4, Mich., it is offered in three models for use with drills of 5/8-, 7/8-, and 1 1/4-in bit capacities.

Its magnet control switch has four positions: low for positioning bit to punchmark location, medium and high for holding while drilling, and a demagnetize position. Working by electricity, it incorporates a safety feature which allows the unit to cling securely even if the current is cut off; it will only release when set to demagnetize. A built-in spotlight for locating bit also serves as a signal to indicate on and off condition of the magnet base. The magnet action is able to withstand a direct pull of 1000 lb for the smallest unit, 2000 lb for the largest. Permissive drill bit pressures range from 500 to 1200 lb.

Adjustable Creeper Headrest

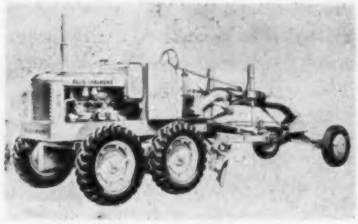
Easily attached to any creeper is the "nO-aKe", a new headrest adjustable to five positions. It also serves to extend creeper length. The headrest is padded with foam rubber and attaches permanently by means of one bolt which is supplied. It lists for $3.75 and is available from Midstate Mfg. Co., 1131 S. Bannock St., Denver, Col.

new products

Diesel Motor Grader

A new 6-cyl, valve-in-head diesel engine, rated 50 brake maximum hp at 1625 rpm, has been placed in the Model D motor grader, previously available from Allis-Chalmers Mfg. Co., only with gasoline power. The new engine has a 3 7/16-in bore and 4⅛-in stroke, with 230-cu in piston displacement.

Direct starting is by a 12-v electric system. The engine incorporates replaceable wet-type cylinder liners, a bypass cooling system with high-capacity water pump, pressure lubrication, aluminum alloy pistons, a simple fuel injection system, and four fuel filters. Weight is distributed 2760 lb on front wheels and 6590 lb on rear wheels. Blade pressure is 4900 lb.



Speeds with the 7.50 by 20 tires of the diesel-powered grader range from 2.6 mph in first to 25.2 mph in fourth gear. Basic design features of the Model D such as roll-away moldboard, single-member tubular frame, tandem drive, compact and rugged gearing, heavy drawbar, and 1-piece circle are included.

Lubricator for RR Journal Box

Designed to end railroads' most costly freight car operating problem, the hot box, U.S. Rubber Co., Rockefeller Center, New York 20, N. Y., has developed a sponge rubber lubricator for the journal box.

Called Ever-Pac, the lubricator forms a sealed oil reservoir at the bottom of the journal box and "pumps, squeezes, and wick-feeds" filtered oil into a felt pad that is in constant contact with the rotating journal. It is said to give smooth, controlled, and fully adequate journal lubrication. Without using oil seals or special dust guards it is claimed to prevent loss of oil by leakage or splashing.

The lubricator consists of an absorbent synthetic sponge rubber pad with an absorbent felt wick-pad fitted to the top surface of the rubber pad like a saddle. Six wick ends pass through slots in the rubber pad down into a rectangular recess formed by the underside of the pad. The recess provides an enclosed oil reservoir at the bottom of the journal box, which holds two pints of oil.

Another two pints are absorbed by the pad and wick during saturation before application. The wick is changeable. A 3-way oil delivery to the journal is obtained by capillary action of the wick ends and pumping and flexing of the pad. Oil is pumped by journal movement.

Because of its compression fit, the lubricator molds itself against the interior of the journal box so that it cannot be dislodged. This is said to prevent loss of oil through the openings of the journal box, and the entry of water or dirt. Both wick and sponge pad are also claimed to filter out foreign matter from oil before it reaches the journal.

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ENGINE TEST
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ENGINE DYNAMOMETER . . . complete with
ENGINE TEST STAND equipped with
UNIVERSAL MOUNTING ADAPTERS and
UNIVERSAL ENGINE COOLING SYSTEM

Clayton universal mounting adapters speed up diesel and gasoline engine test procedures. Engines of up to 1200 h.p. can be set up in a matter of minutes. Alignment is automatic. The Clayton Engine Test Stand, fitted with these adapters and the Clayton cooling system, and combined with the Clayton Series 17 Engine Dynamometer, provides a practical test facility for any engine rebuilding establishment.

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BOX 550, EL MONTE, CALIFORNIA
Name and type of engine serviced _____
Please send us complete details on use of Clayton Engine Test equipment and recommended requirements for testing engine named.
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new literature

Hydraulic Seals

Quad rings, their composition, specifications, applications, and advantages, are discussed in a 10-page folder put out by Minnesota Rubber and Gasket Co., 3630 Wooddale Ave., Minneapolis 16, Minn. Factory-approved methods for installation are described and typical applications are shown in photos and cutaway drawings. Illustrations and instructions for finding correct groove dimensions are also supplied.

Magnesia Insulation Manual

The Magnesia Insulation Manufacturers Assn., Washington 4, D. C., has completed a revised 80-page edition of its manual on 85% magnesia insulation, offering new engineering and product data. Copies are offered free to those concerned with heat insulation.

Power System Oil Maintenance

Complete details on the installation and operation of a system for preventing deterioration of oils used in power systems is presented by Aluminum Co. of America in a 118-page book. The book, "Activated Alumina Maintenance Program—Power System Oils", describes how oils can be kept continuously in prime condition throughout the life of power equipment by using activated alumina.

Activated alumina is a granular absorbent material which, on contact with oil, is said to remove acids and prevent deterioration and sludge formation. Treatment of diesel crankcase oil is discussed in the general maintenance procedure section. More detailed information for diesel engine operation is now under preparation and will be available at some future date. Copies of this projected report can be requested from the nearest sales office of the company and names will be filed until the report is finished.

The general book itself is of value to operators of power systems and may be obtained by writing the company, 764 Alcoa Bldg., Pittsburgh 19, Pa.

Service Failure Reports

Royal-Liverpool Insurance Group, 150 William St., New York 38, N. Y., announces that it has received a supply of recent service failure studies from an English insurance company, for distribution in this country.

The 256-page volumes contain documented case histories of failures of engine parts in service, illustrated by photographs and charts. One interesting case concerns an unusual big-end bearing failure in a 12-cyl, 2-stroke diesel running at 750 rpm. Another illustrates the danger of trying to reclaim highly stressed parts by fusion welding. Two diesel engine crankshafts cracked in this case after a service life of only 1300 hr.

Here's Why

PERFORMANCE IS BETTER WITH Bendix STARTER DRIVES

CHECK and COMPARE THESE FEATURES

- Starting motor can be mounted more easily and in more positions.
- Requires no actuating linkage—solenoid can be placed in any convenient position.
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It takes a truly outstanding product to receive over 100,000,000 endorsements. Yet, that's the number of Bendix Drives that have been installed. No other starter drive approaches this record of outstanding performance. That is why, whatever your type of diesel or whatever its purpose, it will pay you to specify Bendix* Starter Drive for the most economical installation and dependable performance. *REG. U.S. PAT. OFF.

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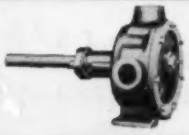
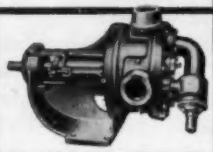
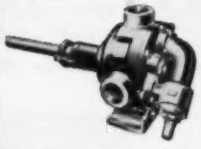
PICK THE RIGHT VIKING PUMP for your needs

it's easy with this Simple Chart

	Catalog	Service	Capacity	Maximum Pressure	Features
	Ask for Section Bd	General Purpose Pumps for Handling Liquids Ranging from Fuel Oil to Molasses	½ to 1050 G.P.M.	50 P.S.I. Non-Lubricating Liquids 100 P.S.I. Lubricating Liquids	Complete Range of Materials. Packed or Mechanical Seal. Jacketed Equipment.
	Ask for Section Cd	Heavy Duty Pumps Handle Both Thin and Very Viscous Liquids	10 to 300 G.P.M.	100 P.S.I. Non-Lubricating Liquids 200 P.S.I. Lubricating Liquids	Complete Range of Materials. Packed or Mechanical Seal Jacketed Equipment.
	Ask for Section Dd	Underwriters Pumps Handle All Types of Clean Hazardous Liquids	5 to 300 G.P.M.	50 P.S.I.	Standard Fitted Steel Fitted Bronze Fitted All Bronze Construction. Packed or Mechanical Seal.

Your Viking district office or distributor will furnish complete information on these or many other Viking rotary pumps to fit your needs. Send for any of the above catalogs or check with your nearby Viking distributor.

VIKING PUMP COMPANY

Cedar Falls, Iowa

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MODEL K-120

universal peak firing and compression pressure indicator

The Model K-120 is the only maximum pressure indicator that can be used as a compression tester on small, high-speed engines and as a firing pressure indicator on engines having indicator valves. Patented Kiene diaphragm type check valve of stainless steel has no springs or piston, no complicated adjustments, temperature corrections or pressure loss. Bleeder valve permits release of indicator pressure for repeat readings. This instrument gives true pressure readings with an uncompensated gage.

Adaptors for most models U.S.A. engines. Others made to order at reasonable prices.

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new literature

Standardized Gearing

Foote Bros. Gear and Machine Corp., 4545 S. Western Blvd., Chicago 9, Ill., has released an engineering manual on its complete line of Duti-Rated lifetime gearing. All standard gear sets available are listed by center distance and capacity to give most convenient selection possible for specific applications. In addition, the 30-page book contains helpful aids in selection of proper gear sets. Efficient gear arrangements are shown and a section is devoted to maintenance tips.

Piping System Yardstick

A. M. Byers Co., Pittsburgh 22, Pa., has issued "True Piping Economy", an 8-page booklet which measures the basic cost factors in installation of piping systems. It compares wrought iron and other types in terms of initial purchase, installation, and maintenance costs. Several case histories of installations are also presented.

Railroad Wheel Grinder

An 8-page illustrated folder has been issued by Whiting Corp., Harvey, Ill., describing its grinder for reshaping railroad wheels without removal of wheel or truck. Drawings depict the entire truing operation; a cutaway view shows construction details; and there are installation photographs.

Solar Energy Directory

Stanford Research Institute has prepared a 300-page directory of world solar energy research activities for the Assn. for Applied Solar Energy, Mayer-Heard Bldg., Phoenix, Ariz. Entitled "Applied Solar Energy Research", it includes a selective bibliography of technical and scientific publications, with a briefing of each.

The directory is cataloged by the 27 countries in which research is carried on. Its purpose is to provide a common point for greater effort in this field to prepare for eventual diminishment of conventional fuel resources.

Driving Cummins Diesels

Cummins Engine Co., Inc., Columbus, Ind., has released an illustrated 64-page, pocket-size handbook to enable drivers to get the best performance and fuel mileage from their Cummins diesel-powered trucks. To present the proper practices, cartoon style is used to tell the story of two drivers who are learning to drive the trucks.

Important rules for the first 50-hr break-in period are given. Pre-start checks are described. On-the-road driving instructions follow, giving best operating practices from cruising stretches to up-hill grades. Various correctives for possible starting and other troubles are also discussed.

Diesel-Electric Crane

An illustrated 2-color folder has been released by R. G. LeTourneau, Inc., Longview, Tex., describing its new self-propelled diesel-electric revolving crane. Each feature is illustrated by use of on-the-job photos. Performance specifications are given in chart-form.

organizational news

Arthur A. King

Petter Executive Change

The Petter Diesel Engine Div. of Brush Aboe, Inc. has announced the appointment of Arthur A. King as executive vice president and director to succeed David Mansell. Mr. Mansell has been promoted to sales manager of the National Gas & Oil Engine Co., Ltd., a member of the Brush group in England. He leaves for this post in August.

Mr. King started his career with Petters Limited in 1931. During the past seven years he has been engine sales manager for the Brush group in the Far East, with headquarters at Singapore.

Robert Campello

Marion Sales Manager

Latest addition to the Marion Power Shovel Co. is Robert Campello, who enters in the post of sales manager. Mr. Campello was previously associated with Bucyrus-Erie, where he served in various sales capacities for 17 years. Prior to that he was with Tractor and Equipment Co. and H. O. Penn Machinery Co.

Leece-Neville Addition

L. W. Smith is the newly appointed manager of the Distributor Sales Div. of Leece-Neville Co. He was formerly associated with the Radio Corp. of America. In his new post, Mr. Smith will direct sales activities with automotive electrical wholesalers in the United States and Canada.

L. W. Smith

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- AMMETERS — Hermetically sealed magnetically shielded, dependable
- TEMPERATURE GAUGES— Remote indicating vapor pressure or direct metallic
- OIL PRESSURE GAUGES— Super sensitive, with full overload protection

Whenever you are selecting the gauges for your new models, look to the Rochester Manufacturing Company for the latest in design and dependability . . . for the best rugged service.

Call on your Rochester Sales Engineer today. He's a specialist, ready and well qualified to serve as your technical advisor on engine gauges. Write, wire or call.

SERIES 2000

New ROCHESTER ENGINEERED PRESSURE SWITCH

Here's a switch that's designed for heavy duty application, close "on" or "off" differentials. Consistently holds precise cut-in, cut-out settings. Available in single and double terminal models. ¼" or ⅛" thread pipe fitting.

Rochester

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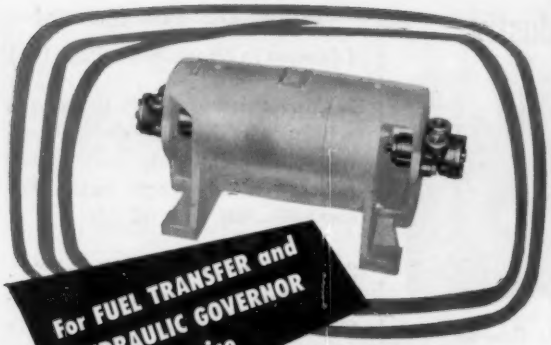

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MODEL L PUMPS ARE PERFORMANCE-PROVED

Throughout the diesel industry, Tuthill Model L pumps are recognized for their dependability in fuel transfer and hydraulic governor service. Model L is a mechanically-sealed, positive displacement internal-gear rotary pump, assuring quiet, leak-free operation with low power consumption. Capacities from .33 to 6 g.p.m. in wide pressure ranges. Available as single or double-pump units. Write for Catalog No. 101 including Pump Guide for diesel applications.

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DIESEL CRANKSHAFTS

and Miscellaneous

DROP FORGINGS

Weighing Up to 4,000 Lbs.

THE PARK DROP FORGE CO.
Gordon Park At E. 79th
Cleveland 3, Ohio

organizational news

Clevite Service Appointments

The appointment of five regional managers to fill newly created executive posts has been announced by Clevite Service, replacement unit of Clevite Corp. R. H. Wickersham will operate out of Atlanta; Dale Huff, San Francisco; R. F. Cooper, Kansas City; H. E. O'Neill, Cleveland; A. H. Barrow, New York City.

Under the direction of A. M. Currier, Jr., sales manager, the men will be responsible for all after-market sales of bearings and bushings marketed through NAPA under the Monmouth brand name and produced by Cleveland Graphite Bronze Co.

Amot Representative

The R. P. Margarigal Co., Media, Pa., has been appointed as representative of Amot Controls Corp., in the states of New York, New Jersey, Pennsylvania, and in Washington, D.C.

Cooper-Bessemer Changes Three

Three promotions have occurred on a managerial level at The Cooper-Bessemer Corp. C. R. Jones is now manager of Western Canada, John McKissick is the new manager of the Seattle office, and George W. Edick has become manager of compressor and stationary engine sales in New York City.

Mr. Jones, formerly manager of the Seattle office, first associated with the company in 1936 after working as a plant operator in Alaska. He was assigned to the Los Angeles office in 1937 and appointed Seattle manager in 1941.

C. R. Jones

J. McKissick

G. W. Edick

Mr. McKissick started with C-B in 1941. Before his assignment to the San Francisco and Seattle offices, he worked in the engineering and sales divisions.

Mr. Edick, a member of the company since 1945, became manager of the compressor section in 1946. He was initially assigned to the New York office in 1949.

Cat Names N. Y. Manager

A. C. Kraft, who has been district representative for Caterpillar Tractor Co. in London, has been appointed manager of the company's New York City office. He replaces J. B. Wilson, who is now assistant export manager of the Latin American Div.

Mr. Kraft has been in London over six years, having served in French North Africa prior to that.

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REPRESENTATION IN PRINCIPAL CITIES

news of our industry

Locomotive Obstacle Course

This portion of track located on a spur of the East Erie Commercial Railroad may have the roughest track conditions any locomotive will have to face in actual service. It is General Electric Co.'s riding-quality test track and enables study of locomotive reaction to abnormal track conditions.

There are three sets of rails. One which is 819 ft long simulates staggered low rail joints with a difference of ¾ in between high and low points. The second set has a 1½-in difference between high and low points. The third set has a ¾-in lateral wave in the rail length for a total of 819 ft followed, after a 936-ft stretch of straight level track, by a last section where the lateral wave amplitude is increased to 1½ in.

Effects noted on locomotives tested by the company have resulted in corrective measures for units that are to be used on particularly rough track.

Alco-Australia Agreement

Alco Products, Inc. announces that it has reached a license agreement with A. E. Goodwin, Ltd., Glebe, Australia, for that firm's manufacture of Alco locomotives in Australia. First units built under the arrangement will be six "world" locomotives for the South Australian Railways. Diesel engines for the units will be built by Alco and Goodwin will manufacture most of the other components.

Officials stated that the agreement covers all Alco locomotive models. Australian railways, according to the same officials, are turning more and more to diesel-electrics as new equipment. There are 20 diesels of Alco-make now in service in the country.

What Do You Know!

(*Answers to Questions on Page* 101)

1. Correct answer is "c". Capacity is a function of both input torque and rpm (in other words, horsepower) rather than any single factor. For discussion, see Page 50.

2. Correct answers are "a" and "c". Since fluid couplings always transmit full input torque, output rpm must reflect power losses. Losses, especially at high slip, result in fluid heat. At 100% slip, full input power must be dissipated as heat. See article mentioned above.

3. Correct answer is "a". Torque converters automatically make available the exact torque required by load conditions, greatest with stalled output shaft. See article above.

4. Correct answer is "b". Some fluid couplings with straight radial vanes can operate in either direction, but the converter's complex blading does not permit this. Again see the article mentioned above.

5. Correct answer is "a". Exhaust energy is dependent on engine output, not altitude. Lowered air density permits this energy to turn blower faster, pumping more less-dense air but producing the same *weight*. See article on Page 90.

6. Correct answer is "b". Waukesha gives valve lash settings at which intakes and exhausts will open and close respectively at TDC as a means of checking timing accuracy. GM measures injector depression. See article on Page 100.

7. "d" is the feature that does not apply. This is more characteristic of induced draft fans, but with air cooling, turbulence is desirable to improve heat transfer. See article appearing on Page 92 for details.

8. Correct answer is "b". Thin-walled flat tubing as used in these cores will not meet pressure requirements of most lube oil systems. See the article mentioned above.

Mr. Ford's Idea

WILL WORK FOR YOU, TOO

Henry Ford believed in mass production—in producing so many MODEL T's that the cost per car was brought within everyone's reach.

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If you're a U. S. or Canadian DIESEL POWER reader, you pay $3.00 for a one year subscription.

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Enter these 1 year subscriptions at: $3.00 each (1-4 orders); $2.00 each (5-9 orders); $1.50 each (10 or more orders). Subscription fees are enclosed.
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ENGINEERED FILTRATION SERVICE

INDUSTRIAL AGRICULTURAL AUTOMOTIVE & MARINE

news of our industry

GM's Lightweight Train

At the request of a committee of railroad presidents, General Motors Corp. has designed and is building a lightweight, low-cost passenger train capable of carrying 400 passengers and reaching speeds of over 100 mph for sustained stretches. The train was designed after the committee asked car builders and locomotive manufacturers to come up with new ideas for passenger-hauling equipment that would reduce investment and operating and maintenance costs, lower the center of gravity, increase average speed, and improve riding comfort.

The new train will consist of 10 coaches and a 1-unit diesel locomotive. The cars were adapted from the body of GMC Truck & Coach Div. 40-passenger intercity-type buses having air ride suspension. Baggage compartments are under the floor as in modern buses so that passengers will ride at a higher level than other lightweight trains. However, the center of gravity will be 10 inches lower than in present standard railroad coaches.

The lower center of gravity and light weight of the train will permit the faster speeds. The locomotive, powered by one 12-cyl GM diesel with 1200 hp for traction, will consume approximately 1.3 gpm of fuel at top speed with full load and in level country.

GM states that existing proven components have been used in the new train wherever feasible for mass production economy. As a result, the locomotive of the new train will contain a standard GM diesel engine and the EMD generators, traction motors, and control apparatus used in present locomotives. The car bodies will be from GMC Truck & Coach Div., air conditioning from the Frigidaire Div., auxiliary diesels for train heat and air conditioning from Detroit Diesel Engine Div., and auxiliary generators from Delco Products Div.

Upping Metal Heat Resistance

Coatings and refractory interface alloys are showing promise of permitting extended use of relatively inexpensive and plentiful metals in the higher temperature ranges. Ceramic coatings and special surface treatments seem to be moving ahead rapidly. At least two current production automobiles are using GM's "Aldip" process for treating engine valves.

This process results in an aluminum-ferrous interface to an appreciable depth, with a thin aluminum overlay. Tests show a remarkable increase in resistance to very high temperatures. Arthur Tickle Engineering Works uses this process under GM license for many parts, among which are piston crowns and exhaust manifolds.

The Bettinger Corp., working closely with Norton Co., has produced new coatings called "Rokide Series". Bettinger will be Norton's first licensee for this new process. The series are said to permit metals to be used at temperatures from 3000°F to 3600°F. Rokide A, sprayed in melted form on steel, magnesium, and aluminum, uses aluminum oxide as a base.

when the new power is a Diesel with

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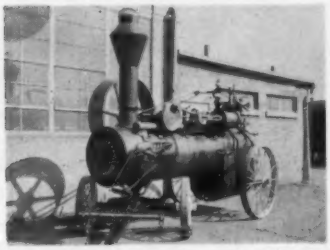
news of our industry



80-Year-Old Cooper-Bessemer

One of the few of its kind still in existence, this engine was acquired by the Cooper-Bessemer Corp. from a farmer in Missouri and restored to its former grandeur. It was built by the C. & G. Cooper Co., forerunner of Cooper-Bessemer, about 1875. Weighing 7000 lb, it operates by steam, develops 15 hp, and was used for threshing.

Mr. Ralph L. Boyer, vice president and chief engineer of the 121-year-old engine-building firm, supervised the rebuilding of the machine. It will be placed alongside its present-day diesel and gas engine counterparts in a Cooper-Bessemer museum which will soon be built.

Vanasil Pistons in Stock

In their development program to serve the national market for heavy-duty replacement pistons, Gillett & Eaton have announced warehouse stocks of Vanasil pistons at the following locations: Automotive & Industrial Whse. Co., 1341 S. Hope St., Los Angeles, Cal.; Piston Supply Whse., 2768 Grove St., Oakland, Cal.; Denver Bearing Co., 780 Lincoln St., Denver, Col.; and Bethlehem Equipment Co., 109 W. 64 St., New York, N. Y.

Catalogs and price lists may be obtained from the nearest warehouse, or the company at 846 Doughty St., Lake City, Minn.

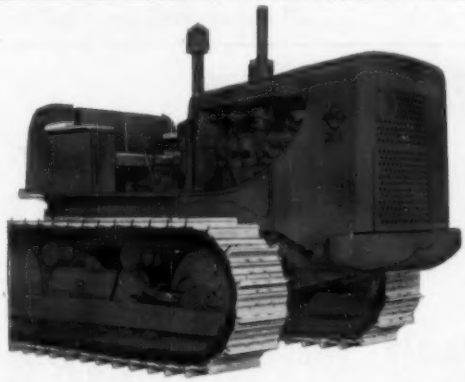
Worthingtons in Wyoming

Six natural gas engines have been supplied to the Continental Oil Co. by Worthington Corp. They are being used in Continental's 280-well Sussex oil field in Wyoming to help supply power for the 15,500-bpd field and also provide electric power for the nearby town of Linch. Continuous power for pumping 24 hr per day is given by the engines.

N&W Gives In—Orders Diesels

After years of clinging to steam power, the coal-hauling Norfolk & Western Railway has issued an order for eight diesel-electrics, delivery set for September. The hold-out road has always designed and built its own locomotives, but the $1,400,000 diesel order went to outside manufacturers.

Four of the locomotives will be built by Alco Products, Inc.; the builder of the other four has not as yet been announced. Robert H. Smith, president of the railroad, revealed that the diesel order is not a major breakthrough and that the N&W will continue to work with coal. The new units will go into service on a lightly traveled branch as single units for yard switching and in multiples of three and four for road service. They will release the heavy-duty steamers for mainline work.



United Air Cleaner Protects New Allis-Chalmers Tractor

This new Allis-Chalmers HD-16 crawler tractor is ready to wade into the dusty atmosphere of construction jobs, mining, bulk material handling work, etc. — it is protected by a United Oil Bath Air Cleaner. Even under the grittiest work conditions only clean, abrasive-free air will enter the combustion chamber of its powerful new engine. The protection furnished by the United Cleaner adds hundreds of hours to the life of engine parts.

Whether it's the heavy-duty HD-16 or a small, portable power unit, United has an air cleaner — or can build one — to fill the bill. We invite your inquiry.

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news of our industry

Diesel Power Conference

Iowa State College has turned over its campus facilities for the holding of its sixth diesel power plant conference, scheduled to run from July 18 to 20.

July 18 will consist of a session on engine operation in which H. W. Hanners, White Diesel Engine Div., White Motor Co., will discuss the theory of diesel operations; and M. E. Bond, Cities Service Oil Co., will give a talk on the development of engine lubricants and field wear test data. A panel discussion on practical methods of improving efficiency will follow, participated in by engineers from Stanley Engineering Co., Corn Belt Power Cooperative, Standard Oil Co. (Ind.), Cooper-Bessemer Corp., and Fairbanks, Morse & Co.

July 19 will have a morning session on water treatment and an afternoon session on accessories. Application and operation of cooling equipment will be the subject of A. D. Bogus, Young Radiator Co.; and W. J. Evans, Woodward Governor Co., will discuss speed droop and its application in parallel operation of diesel generating units.

July 20 will offer a working session on governors.

RUGGED ACCURATE

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Long Island RR Banishes Steam

Steam locomotives will vanish from the Long Island Rail Road by early autumn. A $1,600,000 order has been placed with Alco Products, Inc. for ten 1600-hp diesel locomotives in order to retire the road's 12 remaining steamers and complete non-electrified branch dieselization.

The new locomotives will give LIRR a fleet of 75 diesels, more than half of which will be assigned to passenger service. These will pull about one-fifth of the 690 trains operated daily. The remainder are self-propelled by third rail power.

Announcement of the order was hailed by the commissioner of air pollution control for New York City as a step forward in the elimination of smoke and soot.

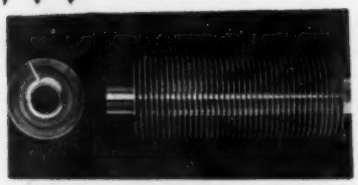
The railroad had embarked on a 12-year rehabilitation plan 11 months ago under which it had assumed that complete dieselization would occur toward the end of the program. Economies resulting from this early elimination of steam locomotive and servicing facilities are expected to make the diesels pay for themselves in about five years.

LMOA Annual Meeting Program

A preliminary program for the annual meeting of the Locomotive Maintenance Officers' Assn., scheduled to be held in Chicago, Sept. 12-14, has been released.

Among the topics of the first day's events will be a report on power assemblies and bearings for diesel mechanical maintenance; and repairs and reclamation of diesel parts in railroad shops. Sept. 13 will have a discussion of the fullest possible use of existing shop facilities. Sept. 14 will see delivery of reports on control of electrical delays and ground relay action; diesel axle, wheel, and truck maintenance; study of oil effects in water of diesel cooling systems with elimination recommendations; and a positive electric, mechanical diesel maintenance program.

new products



Heating and Cooling Coils

Smooth-fin coils, used in solving difficult heat transfer problems by Aerofin Corp., Syracuse 1, N. Y., are now being used for the company's standard heating and cooling applications. As a result of the smooth-fin construction, the coils are said to offer more surface per sq ft of face area, lower airway resistance, fewer rows of tubes for a given Btu transfer in a given area, smaller face area due to practical use of higher air face velocities, less weight, and better drainage.

Many more fins can be used per inch of tube length. For optimum service, aluminum fins are spaced 14 per in, copper 12 per in. The wide contact base of the new tapered fin is claimed to conduct sufficient heat between fin and tube to make the entire fin an effective transfer surface. And it is not necessary to crimp the fin to provide required contact surface.

Heavy-Duty Battery

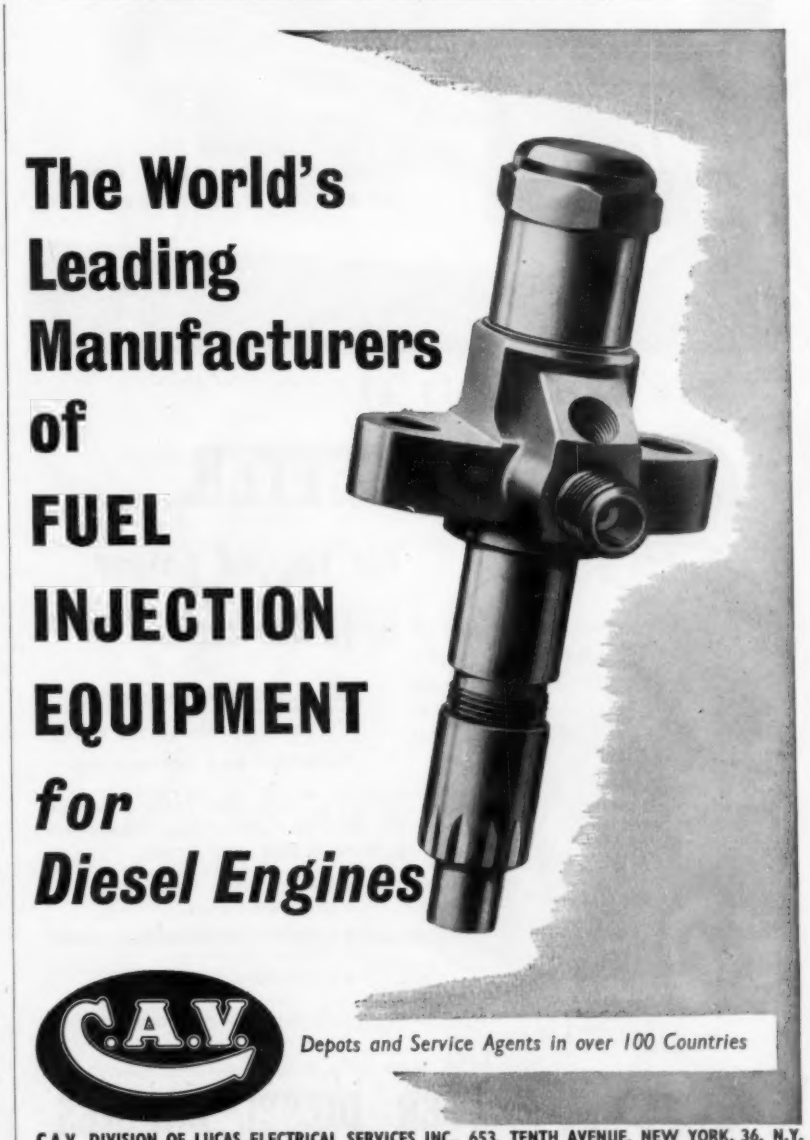
HesteR Battery Mfg. Co., 10 Culvert St., Nashville 10, Tenn., believes its new 6-v and 12-v series batteries to be the most rugged and heaviest for automotive service. Positive plates have 29.57-sq in of surface to deliver 24.7 amp hr of capacity, and have a shelf-type grid pasted to .192-in thickness. The negative grid is pasted to .150-in thickness.

Insulation is triple to eliminate failure from corrosion and overcharge. Separators are of fiberglass, perforated hard rubber, and microporous rubber. Cell connectors are also claimed heavy enough to carry the biggest current requirements and resist burnouts. The container is stated to have great resiliency to resist breakage and absorb vibration, as well as provide greater electrolyte volume. The 6-v series has 7 group sizes; the 12-v series, 3 group sizes. They are for use in trucks, buses, off-highway construction equipment, and vehicles carrying heavy-duty generators.

Visual Corrosion Standards

Copper strip corrosion standards are being made available by the American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. They are used with Method D 130 to determine corrosiveness of fuel oils and Stoddard solvent. In the Method a polished copper strip is immersed at a set temperature for a set time in a sample of the material being tested. It is then washed and compared with the reference ASTM standards.

These reference standards comprise a kit of 13 colored strips arranged according to increasing severity of attack. Instructions for use are given. Each set is sealed in plastic and further protected by a plastic carrying case. Together with a copy of the current Method D 130, they are $25 per set.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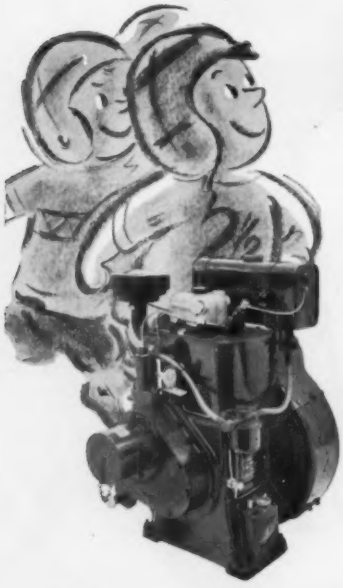

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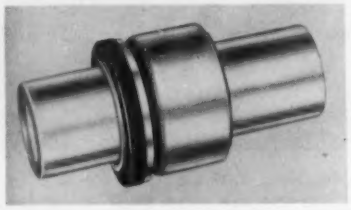
new products



Seal for Rotary Shafts

Elimination of shaft and sleeve wear, elimination of fluid leakage, reduction in downtime, and maintenance cost cuts are claimed by The Garlock Packing Co., Palmyra, N. Y., with its new BB-21A Mechanipak seal designed for use on rotary shafts having pressures up to 150 psi. Seals are available for ⅜- to 3-in diam shafts.

Standard construction includes brass shell, brass washer, and Buna-N bellows for operating temperatures up to 212°F and up to 150-psi pressure. Silicone bellows are provided for temperatures up to 400°F where pressures do not exceed 50 psi. The seals come completely assembled and ready to install.

Bronze Globe Valve

The LQ600 is a new bronze globe valve for throttling service recently introduced by The Lunkenheimer Co., Box 360, Cincinnati 14, Ohio, following a 4-yr testing period during which the valve is claimed never to have leaked or failed.

The performance record is said to have been made possible by a new seating material, patented under the name Brinalloy, and the flat-seat design of the valve. Brinalloy is said to be so resistant to wear and corrosion that it can be permanently fused into the valve for its entire service life and never require replacement, renewal, or regrinding.

The valve is operated by a non-slip handwheel, said to provide firm grip even when hands are wet or greasy. Stem-thread wear is also said to be eliminated. Other features include high-strength bronzes in body and bonnet, and true back-seating to permit safe and easy repacking.

new products

Electronic Control Tachometer

Herman H. Sticht Co., Inc., 27 Park Pl., New York 7, N. Y., is producing Type SA-6 alarm contact tachometer, a dynamic device that indicates machine speeds and also controls them. In addition, it may be used to actuate other equipment, act as a warning device, open or close valves, and stop or start machinery at a preset speed.

The complete unit consists of the tachometer itself, a centrifugal mechanical type with 5½-in dial; an electronic control box having a simple circuit which uses a standard radio tube; a gear drive; and a flexible shaft which connects the tachometer head and the gear drive.

Diesel Fuel Additive

Now being produced by Industrial Chemical Co., 12134 S. Main St., Los Angeles 61, Cal., is an improved version of their diesel fuel additive, this one called Induco DX200. The newer product is claimed to clean up carbon sludge faster.

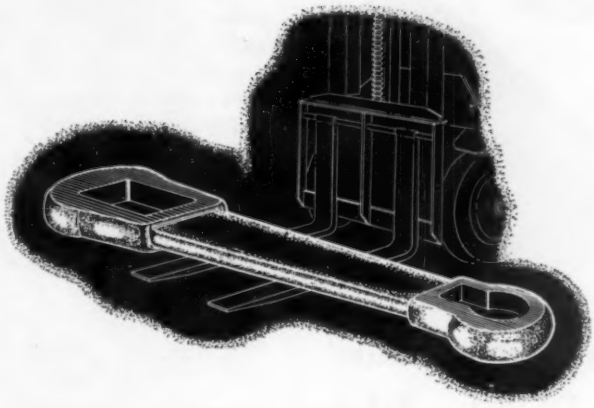
The compound is stated to have an emulsifying and homogenizing action. Impurities such as sludge, gums, tar, resins, acid, water, and sulphur, are held suspended in bubble form. Accordingly, the manufacturer declares, more Btu's are added in fuel burning and the engine is kept clean. Benefits claimed are less engine maintenance, longer engine life, and fuel and oil savings.

Improved Tube Bender

Parker Appliance Co., 17325 Euclid Ave., Cleveland 12, Ohio, is now offering its Model 824 bench-mounted manual tube bender with a toggle clamp for easier and speedier operation. The toggle clamp's simple handle action provides quicker gripping of the tube to be bent.

It is attached by inserting its swivel block pin into the third hole of the bender's radius block. Without shoe insert, it accommodates tubing of 1½-in OD. Shoe inserts are available for sizes ranging from ⅜- through 1¼-in OD.

Worn?
Mismachined?



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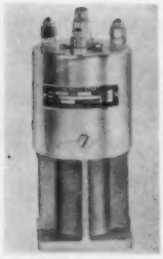
Screw Anchoring Kit

For permanently securing screws or nails in materials which do not have sufficient holding power for them, Holub Industries, Inc., Sycamore, Ill., is offering an introductory kit containing complete materials for average mounting jobs. Specially priced and boxed in a transparent reusable container are 100 12-in by 1-in plastic screw anchors, 100 zinc-plated screws, and one ¼-in drill.

The drill is used to bore a hole in the material into which the anchor is driven and countersunk. Turning the screw into the anchor completes the fastening. The anchors are claimed to hold indefinitely in any material capable of being drilled from wood to glass. They will not deteriorate and may therefore be used indoors and out.

Three-Switch Governor

To supplement its line of 1- and 2-switch governors, Synchro-Start Products, Inc., Skokie, Ill., announces addition of a speed sensitive switch which can be arranged to open or close three separate circuits at three different speeds anywhere between 1200 and 10,000 rpm. As with the company's previous models, the operating mechanism consists of rotating governor flyweights acting upon snap switches.

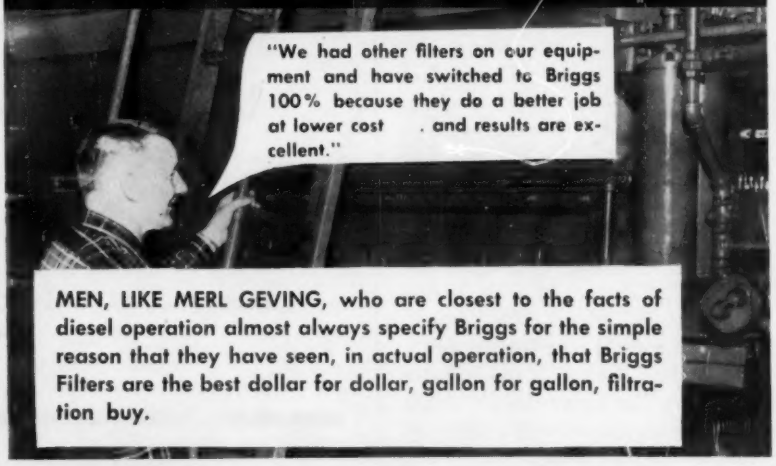


When the unit is used in conjunction with control systems, the functions of starter disconnect, underspeed and overspeed protection are combined. Standard units are splashproof and all parts are either plated or made of non-corrosive metals. The trip points are factory preset to specification but can be adjusted after installation.

"WE SWITCHED 100% TO BRIGGS"

Says Merl Geving, Plant Superintendent

LE SUEUR LIGHT & POWER COMPANY, Le Sueur, Minn.


"We had other filters on our equipment and have switched to Briggs 100% because they do a better job at lower cost . and results are excellent."

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organizational news

Worthington Cleveland Manager

William J. Davies has been assigned to succeed Robert J. Laidlaw as manager of the Cleveland office of Worthington Corp. The appointment came as the result of Mr. Laidlaw's resignation for health reasons. He has been with the firm since 1919.

Mr. Davies began with Worthington in 1937 as a sales trainee at its Harrison works. From 1938 to 1942 he served as application and sales engineer at Buffalo, and from 1942 on as sales engineer at the Cleveland office.

William J. Davies

Philip W. Mettling

New President of C. Lee Cook

Philip W. Mettling has been elevated to the presidency of C. Lee Cook Co. He succeeds Fred D. Durham who has resigned to give full attention to his duties as president of Dover Corp., which recently became the parent company of C. Lee Cook.

Mr. Mettling first became associated with Cook at the end of 1953 as vice president and general sales manager. He had been with Cooper-Bessemer for 11 years previous to that, as manager of its Los Angeles office.

Pennsalt Elects New President

William P. Drake has succeeded George B. Beitzel to the presidency of Pennsylvania Salt Mfg. Co. In making the announcement, Mr. Beitzel revealed he will continue his association with the company as a member of its board.

At 42 years of age, Mr. Drake will be the youngest president in the company's 105-year history. He has 21 years of service with Pennsalt, starting as a summer trainee while still in college. He began as a maintenance worker and was assigned to supervisory duties after three years.

In 1941 Mr. Drake became manager of the chemical specialties department and subsequently served as assistant vice president and vice president in charge of sales. In 1954, when the company decentralized, he became general manager of its industrial chemicals division. He was appointed executive vice president and elected to the board early this year.

Detroit Diesel Appointments

Charles W. Frederick is now director of engineering, and Clyde W. Truxell, Jr., works manager, at GM's Detroit Diesel Engine Div. Mr. Frederick replaces Laurence S. Sheldrick, who has been named technical assistant to the general manager. Mr. Truxell takes over from Albert F. Davis, who will become director of engineering and manufacturing at the Diesel Equipment Div.

Starting as a research engineer in the corporation in 1923, Mr. Frederick has been with the Chevrolet Div. since 1932. He served as truck engineer, design engineer, and chief aviation engineer before becoming assistant chief engineer in 1952, his latest post.

Mr. Truxell joined GM in 1932 as a designer. He became chief engineer of Detroit in 1938 and later chief inspector and superintendent of injectors. He was made director of engineering and sales for the Diesel Equipment Div. in 1944 and was transferred as director of engineering and manufacturing for Aeroproducts operations at Allison in 1953.

C. W. Frederick

C. W. Truxell, Jr.

How much of your engine maintenance bill is due to repair of breakdowns that could have been avoided—*if you'd had advance warning?*

At a fraction of that cost, Alnor Exhaust Pyrometers offer you a constant check of engine performance—advance warning of

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Get Full information—Quickly! Your nearby Alnor Diesel specialist is conveniently listed in the classified directory. Ask him to help you select the Pyrometer and thermocouple assembly designed for your engine. Or send for Bulletin 4361 with complete details of the full Alnor line of Pyrometers.

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organizational news

John P. Kelly

Waukesha Chief Draftsman

The appointment of John P. Kelly to succeed Lloyd M. Kanters as chief draftsman of the engineering department has been announced by Waukesha Motor Co. Mr. Kanters retires with a 40-year record of service with the company.

Mr. Kelly has had shop experience as a machinist with Pullman Standard Car Co. He joined Waukesha as an engineering draftsman in 1946, working on layout and design problems.

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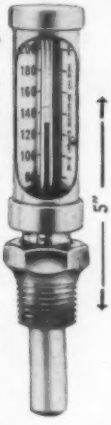

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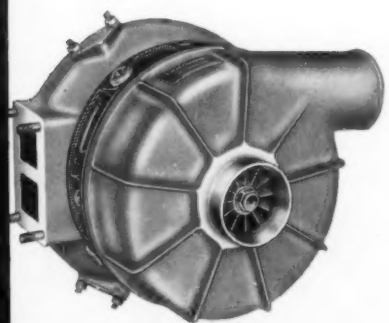

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